

BY-LAWS

of the

TESLA MACHINE COMPANY.

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ARTICLE I.

MEETING OF STOCKHOLDERS.

Sec. 1: The annual meeting of the stockholders of this Company shall be held at the office of the Corporation on the third Thursday in January of each and every year at 4 P.M. for the election of directors and such other business as may properly come before the meeting. Notice of the time, place and object of such meeting shall be given by publication thereof at least once in each week for two successive weeks immediately preceeding such meeting in the manner required by the Stock Corporation Law and by mailing at least six days previous to such meeting, postage prepaid, a copy of such notice, addressed to each stockholder at his P.O. address as same shall appear on the books of the Company. No business other than that stated in such notice shall be transacted at such meeting without the unanimous consent of all stockholders present thereat in person or by proxy.

Sec. 2: Special meetings of the stockholders other than those regulated by statue may be called at any time by a major-

ity of the directors. It shall also be the duty of the President to call such meeting when requested so to do by one director other than himself, and whenever requested in writing so to do by stockholders owning one-third of the capital stock. A notice of every special meeting, stating the time, place and object thereof, shall be given by mailing, postage prepaid, at least six days before such meeting, a copy of such notice addressed to each stockholder at his post office address as the same appears on the books of the Company.

Sec. 3: At all meetings of stockholders, there shall be present either in person or by proxy stockholders owning at least three-fifths of the capital stock of the Corporation in order to constitute a quorum except at special elections of directors pursuant to the General Corporation Law.

Sec. 4: Atall annual meetings of stockholders the right of any stockholder to vote shall be governed and determined as prescribed in the General Corporation Law.

Sec. 5: If for any reason the annual meeting of the stockholders shall not be held as hereinbefore provided, such annual meeting shall be called and conducted as prescribed in the General Corporation Law.

Sec. 6: At all meetings of the stockholders only such persons shall be entitled to vote in person and by proxy who appear as stockholders on the transfer books of the Company for ten days immediately preceeding such meeting.

Sec. 7: At the annual meeting of stockholders the follow-

ing shall be the order of business, viz:

1. Calling the roll.
2. Proof of proper notice of meeting.
3. Report of President.
4. Report of Secretary.

Report of Treasurer.
Report of Committees.
Election of Directors and inspectors of election.

Miscellaneous business.

Sec. 8: At all meetings of stockholders all questions. except the question of an amendment to the By-Laws and the election of Directors and inspectors of election, and all such other questions, the manner of deciding which is specially regulated by statue, shell be determined by a majority vote of the stockholders present in person or by proxy; provided, however, that any qualified voter may demand a stock vote and in that case, such stock vote shall be taken immediately, and each stockholder present in person or by proxy shall be entitled to one vote for each share of stock owned by him. All voting shall be 'wive voce', except that a stock vote shall be by ballot, each of which shall state the neme of the stockholder voting and the number of shares owned by him, and in addition, if such ballot be cast by a proxy, it shall also state the name of such proxy.

Sec. 9: At special meetings of stockholders the provisions of the General Corporation Law shall apply to the casting of all votes.

ARTICLE II.

DIRECTORS.

Sec. 1: The Directors of this Corporation shall be elected by ballot for the term of one year at the annual meeting of the stockholders, except as hereinafter otherwise provided for

filling vacancies. The directors shall be chosen by a plurality of the votes of the stockholders voting either in person or by proxy.

Fec. 1: Vacancies in the Board of Directors occurring during the year, shall be filled for the unexpired term by a majority vote of the remaining directors at any special meeting called for that purpose or at any regular meeting of the Board.

rec. 3: In case the entire Board of directors shall die or resign, any stockholder may call a meeting in the same manner that the precident may call such meeting, and Directors of the unexpired term may be elected at such special meeting in the manner provided for their election at annual meetings.

Dec. 4: The Board of Directors may edopt such rules for the regulation of their meetings and management of the affairs of the Corporation as they may deem proper, not inconsistent with the Laws of the State of New York or their by-laws.

Sec. 5: The Board of Directors shall meet at such regular times as they may fix and whenever called together by the President upon due notice given to each Director. On the written request of any Director, the Secretary shall call a special meeting of the Board.

Sec. 6: All Committees shall be appointed by the Board of Directors.

ARTICLE III.

OFFICERS.

Sec. 1: The Board of Directors immediately after the annual meeting shall choose one of their number by a majority vote

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to be President and in the same manner they shall also elect a Vice President, a Treasurer, and a Secretary, and may also appoint such other officers as they may deem necessary. The elected officers shall serve for one year or until the next annual election. The appointed Officers shall serve during the pleasure of the Board. The Board of Directors shall fix the salaries, if any, that shall be paid to the several Officers of the Company.

Sec. 2: The President shall preside at all meetings of the Board of Directors and shall act as temporary chairman at and call to order all meetings of the stockholders. He shall sign certific tes of stock, sign and execute all contracts in the name of the Company when authorized so to do by the Board of Directors, appoint and discharge agents and employees subject to the approval of the Board of Directors, and he shall have the general management of the affairs of the Comporation and perform all the duties incidental to his office. At the annual meeting he shall present a written report to the stockholders, setting forth in full the condition of the Company. He shall countersign all notes or other evidences of indebtedness authorized by the Board of Directors.

Sec. 3: The Vice President shall in the absence or incapacity of the President perform the duties of that office.

Sec. 4: The Treasurer shall have the care and custody of all the funds and securities of the Corporation and deposit the same in the name of the Corporation in such banks as the Directors may elect. He shall sign certificates of stock and all checks, drafts, notes, and orders for the payment of money,

by the President or Board of Directors. He shall keep and have charge of the books of the Company, and at all reasonable times exhibit his books on a .counts to any director or stockholder of the Company upon application at the office of the Company due no cusiness hours. He shall affix the seal of the Company to all certificates of stock and all other instruments requiring a when so directed by the board of Directors.

of Directors and also the minutes of the meeting of the stock-holders; he shall attend to the giving and serving of all notices of the Company; he shall have charge of such books and papers as the Board may direct; he shall attend to such correspondence as may be essigned to him; and perform all the duties incidental to his office.

ARTICLE IV.

CAPITAL STOCK.

to the Treasurer at such time or times and in such instellments as the Board of Directors may by resolution require. Any full-ure to pay an installment when required to be paid by the Board of Directors shall work a forfeiture of such shares of stock in arrears, pursuent to the Stock Corporation Law.

Sec. 2: Certificates of stock shall be numbered and registered in the order in which they are issued and shall be signed by the President or Vice President and by the Treasurer or Secretary, and the seal of the Corporation shall be affixed

3

In the lettlery out the funds of the Company as authorized by the Irelident or Board of Directors. He shall keep and have charge of the books of the Company, and et all reasonable times exhibit his books and accounts to any director or stockholder of the Company upon application at the office of the Company lead to the Company lead to the Company to all stifficates of stock and all other instruments requiring to the company of the compan

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ARTICLE IV.

CAPITAL STOCK.

Cec. 1: Subscriptions to the capital stock must be paid to the Treusurer at such time or times and in such installments as the Board of Directors may by resolution require. Any failure to pay an installment when required to be paid by the Board of Directors shall work a forfeiture of such shares of stock in arrears, parsuant to the Stock Corporation Law.

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thereto. All certificates shall be bound in a book and shall be insued in consecutive order therefrom and in the margin thereof shall be entered the name of the person owning the shared therein represented, the number of theres and the date the reof. All certificates exchanged or returned to the Corporation shall be marked cancelled with the date of cancellation by the Treasurer and shall be immediately pasted in the certificate to book opposite the memorandum of its issue.

Sec. 3: Transfers of stock shall only be made on the books of the Company by the holder in person or by power of attorney duly executed and acknowledged and filed with the Treasurer of the Corporation and on surrender of the certificate or certificates of such shares.

Sec. 4: Thenever the capital stock of the Company is increased, each bons fide owner of its stock shall be entitled to purchase, at the par value thereof, an amount of stock in proportion to the number of shares of stock he owns in the corporation at the time of such increase.

ARTICLE V.

DIV IDENDS.

Sec. 1: Dividends shall be declared and paid out of the surplus profits of the Corporation as often and at such times at the Board of Directors may determine.

ATTICLE VI.

INSPECTORS.

Sec. 1: Two inspectors of election shall be elected at each annual meeting of the stockholders to serve for one year.

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and if any inspector shall refuse to serve or shall not be present, the meeting may appoint an inspector in his place.

ARTICLE VII.

SEAL.

Sec. 1: The Seal of the Corporation shell be in the form of a circle and shell bear the name of the Corporation and the pear of its incorporation.

ARTICLE VIII.

AMENDMENTS.

Sec. 1: These by-laws may be amended at any stockholders meeting by a vote of the stockholders ownings majority of the stock, represented either in person or by proxy, provided the proposed amendment is inserted in the notice of such meeting; they may also be amended at any meeting of the Board of Directors by a three-fifths vote of the Directors.

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Special Collections Spec Me Coll Tesla Machine Company
New York, 27 Apr 1905
p.d.s., 2 p. (Stock certificate, one share, made out
to George Scherff) 21.380#



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Miscellaneous magazine articles on

Tesla, or toughting on him. (some passages are underlined by Tesla) מייאו בצ

Editorial Comment

Radio Waves and the Transmission of Electrical **Energy for Power**

DR. E. F. W. ALEXANDERSON, consulting engineer of the General Electric Company and the Radio Corporation of America, in an address at the annual dinner of the Sigma Xi Society at the Hotel Astor in New York City, last April, predicted that the radio wave would soon be used for the control of vast amounts of power, and would supersede much of the cumbersome machinery now used in power production and transmission.

"The electric power industry cannot remain much longer untouched by the discoveries of radio," he said. "It is just waiting until this new knowledge has been widened and matured, so that it can be put into use on a wider scale, and this is the real significance of the entrance of the electrical industry into radio, and the latest branch of it relevision." radio, and the latest branch of it, television.

ance of the entrance of the electrical industry into radio, and the latest branch of it, television."

Ten days after Dr. Alexanderson's startling prediction, electric lamps, held or suspended in the air without any connection to power wires, were made to glow brightly when high frequency waves were directed upon them in a demonstration of power transmission by radio by two Westinghouse engineers, Dr. Phillips Thomas and Dr. Harvey C. Rentschler, before the New York Electrical Society in New York City. Dr. Rentschler also displayed an novel radio furnace, in which netallic tungsten, among the most infusible of all metals, was heated white hot in an instant by the radio waves.

"We may visualize," said Dr. Thomas at this demonstration, "a parallel beam of radiation ten centimeters (four inches) across, along which is being sent ten kilowatts of energy. What sort of effects shall we find? Will this be the means for delivering energy for heat and light to individual houses? Dr. Nikola Tesla had a similar idea several years ago. Later improvements in the radio art make it interesting to consider such a possibility once more."

once more."

Guglielmo Marconi, inventor of the Marconi wireless system, while visiting this country last October, for the first time in several years, delivered an address on radio before an notable gathering of scientists at the Engineering Societies Building in New York City, in which he said:

"I hope I will not be thought too visionary if I say that it may be possible that some day electric waves may also be used for the transmission of power, should we succeed in perfecting devices for projecting the radiation in parallel beams in such a

projecting the radiation in parallel beams in such a

manner as to minimize their dispersion and diffusion

manner as to minimize their dispersion and diffusion into space."

Dr Nikola Tesla, one of the earliest pioneers in wireless, inventor of the alternating current system of power transmission, the induction motor, and many other notable electrical devices, the day before Marconi made the foregoing appeal "not to be thought too visionary," wrote a modest but direct statement of what he has already accomplished. Dr. Tesla said: Tesla said:

Tesla said:
"The transmission of power without wires is not a theory or a mere possibility, as it appears to most people, but a fact demonstrated by me in experiments which have extended for years. The recent demonstrations of a number of experts with very short waves, have created the impression that power will be eventually transmitted by such means. In reality, experiments of this kind are the very denial of the possibility of economic transmission of energy. No concentration of energy such as I attain in my

reality, experiments of this kind are the very denial of the possibility of economic transmission of energy. No concentration of energy such as I attain in my wireless power system can or will ever be achieved through the instrumentality of reflectors, for in transmitting energy in this manner the receiver can collect only an amount proportionate to the area exposed to the rays, while in my system it draws the energy from an immense reservoir in ever so much greater quantity. My plans for a power plant have been developed to the point of application, and I am using every effort to give to the world this, my best and most important work, as soon as possible. I have in view a number of places which seem well souted for the purpose, but my warmest wish is to transmit power from Niagara Falls, where the first triumph with my alternating system was achieved."

And meantime the entire world, with its vast resources of electrical energy in inland lakes, rivers and waterfalls, coal, wind, ocean waves and heat of the sun going to waste in billions of horsepower every day, waits patiently while radio scientists monkey with bulbs and reflectors to carry giant loads of channed lightning. It is about time some of them wake up to the fact that while they are shuffling around with little short wave reflector sparks, Dr. Tesla has, experimented with tremendous electrical power flashes, each more than one bundred and filly Teet in continuous length under perfect wireless control. Dr. Tesla has said so himself, his veracity is unquestioned, and his record of great accomplishments thus far backs him up. The "big lusiness" end of the electrical industry ought to dig Dr. Tesla out of his laboratories long enough to say to him "Show me!" for there is enough money in it to suit even the wildest dreamers of Wall Street if he is right. in it to suit even the wildest dreamers of Wall
Street if he is right.

Telegraph and Telephone Age

TELEGRAPHY - TELEPHONY - RADIO

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Cine Cope, One Year, in the United States, Memory, Cubs. Porto Rico. Canada and the Ph Prince Islands 3200. Uther Foreign Countries, \$3.00.

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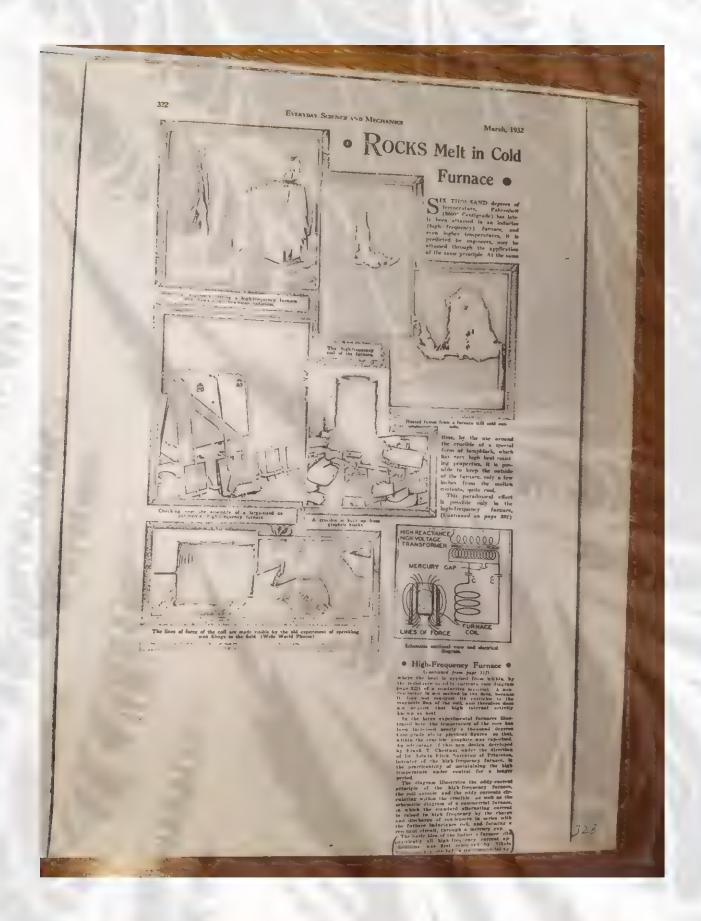
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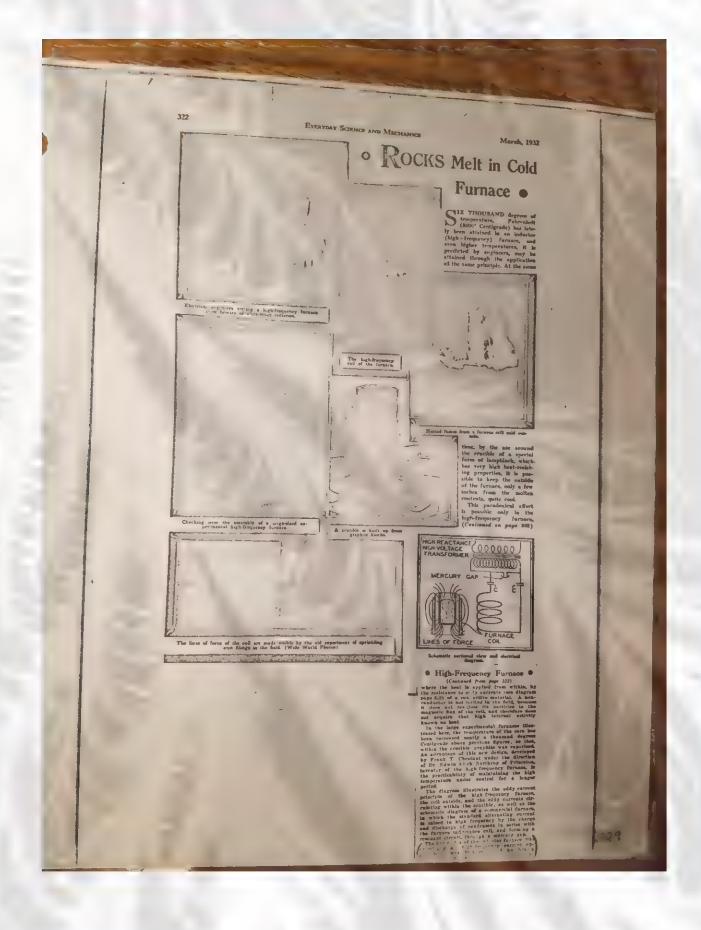
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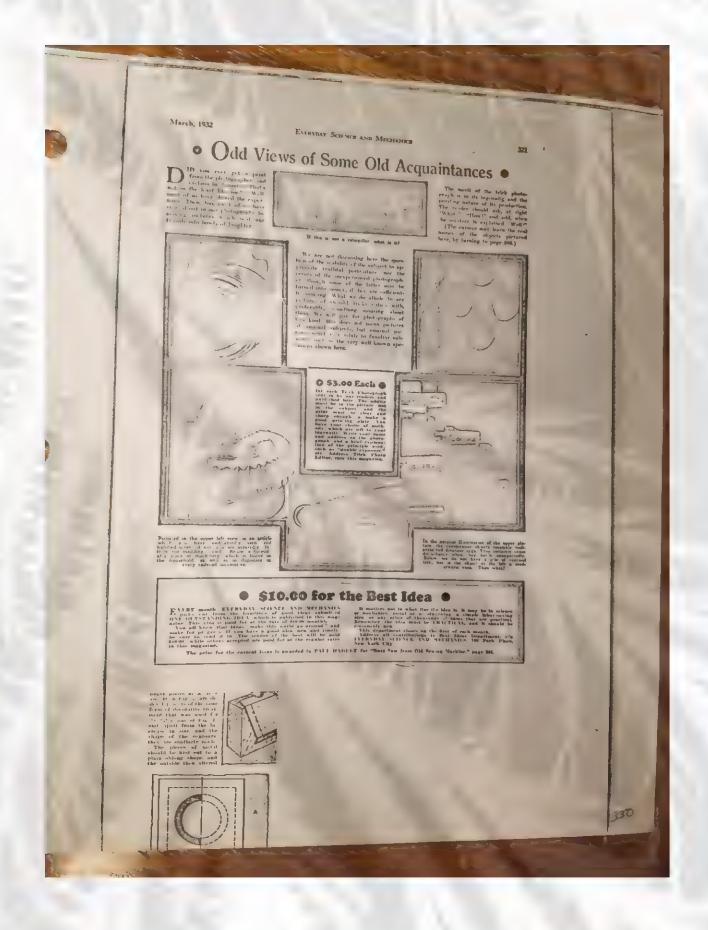
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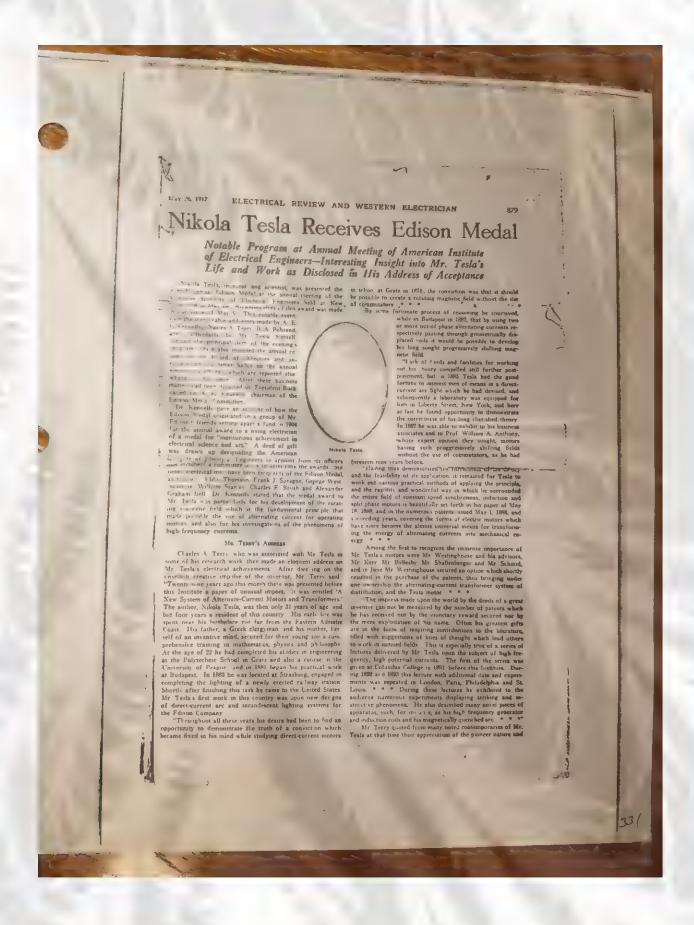
CONTENTS Contornal Radio Waves and the Transmission of Electrical Energy for "Forty odd Years With Thomas A. Edison;" Some of the Wonderful Things He Invented Edison Sees and Hears Himself Speak in a Special "Talking Movie,"_ Students' Course in Technical Telegraphy. By Louis Casper____ Personal Repairing Cables in Philippines. Italy Imports More Apparatus. Telegraph Business in Palestine. Golden Chunks of Wisdom ... Danger Points of Radio Installations; Rule 37, N.E.C.; Need of Better Antennas. By Donald McNicol Vail Medal Heroine Getting Used to Troubled Waters Obstuary . Bad Breaks in Overland Circuit as 'Frisco Folks With Bated Breath Awaited War News. By R. D. Gould. Testing Strength of Tresses With New War News. By R. D. Gould. Testing Stren The Railroads . Telephone Poles Carry Only Part of Burden; Many Millions of Miles of Wire Underground Sweden Extends Long Distance Telephone to Many Countries. Twenty-five Times Faster Than Lindbergh Red Cedar Telegraph and Telephone Poles Eaten by Little Termites, or White New Machine Works Fast in Stripping Wite for Soldering Terminals. Radio-Telegraphic Convention Signed by Seventy-nine Nations. Dr. Lee DeForest Now the Undisputed Inventor of Radio Feed-back and Oscillating Audion

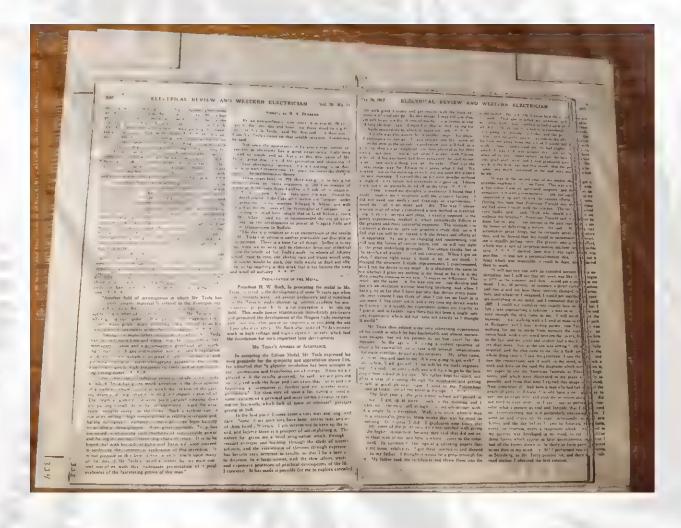
"The Glorious Awakening" at Manila Broadcasting Station. Radio News_

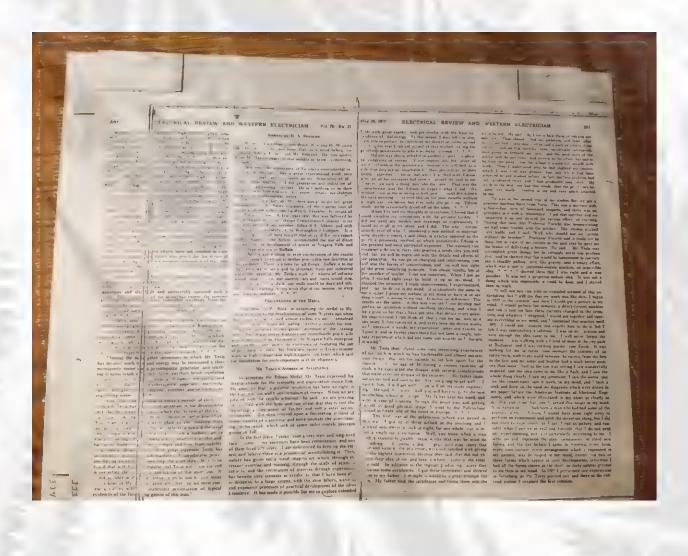












Thave come now to an interesting point when I came to America. I had made some improvements in dynamous for a America. The temporal forms were some the transhinery from manager of the works and to me. You must go to America. America the improvements in dynamous for a America. The temporal forms were so much be tree that the and some most design these machiners for the Feench company to interest homself in my plans machiners for the Feench company to interest homself in my plans in the other side to get someholdy to interest homself in my plans in the other side to get someholdy to interest homself in my plans in the other side to get someholdy to interest homself in my plans in man, who had had no training at fleet that Edison produced upon me was rather extraord and the Wheel I saw this wonder upon me was rather extraord and the Wheel I saw that somehor upon me was rather extraord and the whole I saw that somehor upon me was rather extraord and the south that I had, squandered my himmelf and see the great hours that I had, squandered my himmelf and spent the assessment of the interest of the first members and state of a stuff that fell into my hand. I shought to abset mease of my the interest then git was to have wasted my life on these coaches. Given the git may to have noted anything with one than the state of the state

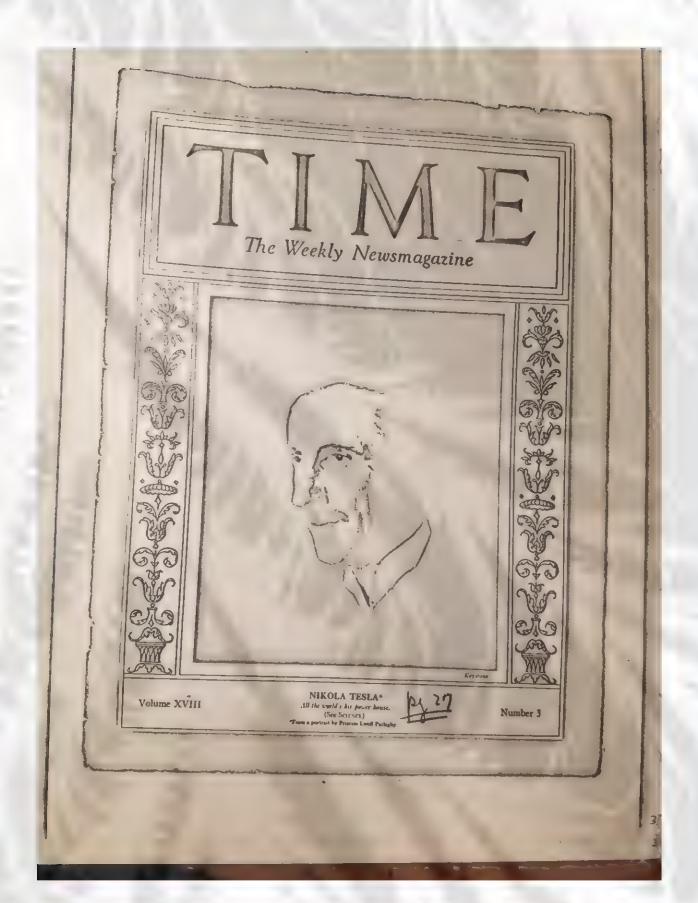
made, and then you know what happened since then. The invention has swept the world.

"Mr Behrend has referred to other inventions of mine. I will say just a few words, because some of my work has been missunderstood. It seems to me that I ought to tell you a few words about other efforts that have shooted my attention later. In 1804 I git and the work in very generous terms, something that is not customary, and among other through he stated that I had really an extraordinary gif for invention. Up to that time, I can assure you, I never realized that I was no invented at all. I looked upon the rotating-field discovery as simply a mathematical deduction. I was a logical, step by step, deduction. I forced this invention, as it were, by strews and levers. I did not get an inspiration, as it were, by strews and levers. I did not get an inspiration, as it were, by the world with the property of the pro

certain point it was condensed and fell to the earth again, and this life instancing stream of water varieties of the life of the li

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SCIENCE

Tesla at 75

Tesla at 75
(See front cover)

On Aikoli Tesla's birthday in midJuly the electrical term which his name
has become is regenerated as a tall, meafre, exple headed man. Reporters hunt
him out of his hotel cubicle for his yearly
interview and for a day his long-standing
fame threes again. People who all their
lives have hird hy means of the devices
he has invented and inspired, people who
have fingent enter were an Alexandro
i olfo, an Andre Mane Ampère, a Georg
from Olom a Char es Augustin de Conforman Olom a Char es Augustin de Conforman Char lives (Aller) and a James Waljare, ca Lings Gal and or a James Waljare, ca Lings Gal and or a James Waljare, the man the Tesla induction motor
which made alternating current practical,
and the Tesla transformer which steps up
osciniting currents to high potentials (15,
coco-coc) volts he avers, with 100,000,000
possible)
Last week was Dr Tesla's 75th burk-

coo doo volts he avers, with 100,000,000 possible).

Last week was Dr Tesla's 75th birth-day Interviewers wished they might see him as he used to be seen in his Colorado laboratory a generation ago, strolling or string like a calm Misstopheles amid blizing thundering cascades of sparks 30 ft long. Tesla carrents alternating at such produgious frequency that they would not harm a la ten But instead they found him, not without some difficulty in seehusion on the world for or Manhattan's Hotel Governor Clinton Pale but healthy, than to ghostiness but strong and alert as ever, he received his callers in quet His hair is slate grey, overhanging eyehrows almost black. His eyes are blue Only their sparkle and the shrillness of his tonce indicate his psychic tension. He wore an ordinary U. S. business surf, a white collin-rattached shirt and a common-place tie.

white collinatached shirt and a commonplace tie

To Nikola Tesla, all the world's a power
house For 40 years he has been reasoning,
calculating and arguing that the earth has
a definite electrical resonance. All that
men need do to have unlimited power at
their command, and that power without
the necessity of transmission wers, would
be to generate electricity in time with the
earth's. The generators might be at witerfails coal numes, anywhere Only possible
drawbacks would be the vast expense of
installation and the fact that every power
house on earth would be obliged to generate the same kind of current, and anyone
could tap the current. There could be no
financial control of electricity.

Nonetheless the late John Pierpont
Morgan believed in the possibility of such
wireless power. That was at the time when
Mr Morgan believed in the possibility of such
wireless power. That was at the time when
Mr Morgan believed in the possibility of such
wireless power. That was at the time when
Mr Morgan believed in the possibility of such
wireless power. That was at the time when
Mr Morgan believed in St. Steel Corp.
and International Mercantile Mar ne. He
was not averse to world control of power
and communications. The House of Morgan is banker for American Telephone &
Telegraph, International Telephone &
Telegraph, Mestern Union, United Corp.
and many another electrical Litility.)
Banker Morgan gave Genius Tesla great
amounts of money for experiment. In
Colorado in 1899, Tesla built a huge induction coil by which he generated and,
he says, sent out wireless waves the same

round marcon cutablished wireless communication but established wireless communication but established wireless communication but established wireless communication of the conception, and the conception of the conception of the conception of the captain of the conception of payers of captain the conception of payers of the conception, the deal when at first hurst upon me was a tremendous shock.

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The wall throw light on many puzzlars phenomena of the cosmos, and many provedules of great medium and produce a market for steel.

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TESLA SPARES & AUTHOR They would not harm a kitten.

A Summer Paradise

A 17,000-acre estate, 2500 feet above the see ... dedicated to riding, golf and healthful recreation... Virginia Hot Springs is the perfect haven for the discriminating American fomily... for the delightful vacation season. vacation season.

The restful informal-ity of the social life in the distinctive Homestead completes the charm of this all-season Paradise . . . Summer cottages are available for the season.

Average Summer tem-perature 66 Degrees

Frite for illustrated booklet or exercistions

CHRISTIAN S. ANDEISEN Managing Director

the foundation of a universal brotherhood that will last as long as humanity itself."

When?

I have been leading a secluded life, one of continuous, concentrated thought and deep meditation. Naturally enough I have accumulated a great number of ideas. The question is whether my physical powers will be adequate to working them out and gas ng teem to the world.

He received brithday greetings from Sir He received brithday greetings from Sir Alexanderson, Lee De Forest, John Hays Hammond Jr., Robert Andrews Millikan, secretary of Commerce Robert Patterson Lamont. Henry Herman Westinghouse, and many another. Their greetings indicate the hope if not the confidence that in a few months" or "a few years" the flame of Nikola Tesla's genus will weld one more astounding new device for mankind.

It is improbable that he will ever device.

ane of Nikola Tesla's genius will weld one more astounding new device for mankind.

It is improbable that he will ever design such a device on paper, let alone in a forchaine shop although before his mind's ever he may see it in every detail, motion, and defect. He is a great visualizer.

His first invention—before he was six and living at his native Smiljan a Croatian village, in what is now Jugoslavia—was something the like of which he had never actually seen. He pictured if curved, pointed at one end, fastened to a string at the other. The child modeled a piece of iron according to his vision and thus had the hook which he needed to catch trogs. Similarly he completely visualized is induction motor, his coils and transitorness, all his inventions, before he electhed and constructed them. He has unlimited confidence in his visual inventiveness. He no onger bothers to build, seldom bothers to make notes. He simply reclines and cerebrates.

Years ago he had a laboratory in Houston Street, Manhittan. It burned down, He lacked money and desire to rebuild. He had an apartment in midtown Manhattan in West 40th Street opposite the Public Library whose engineering room he still occasionally haunts, and near the Engineers Club which he no longer will visit. In that apartment he kept a few terrifying but harmless lightning machines. The swank St. Regis Hotel whither he moved two years ago was no place for such devices. Dr. Tesla contented himself with studying four pet piecons which nested in his rolltop deak. Maids complained. He moved.

Many such stories about him exist. Once, while walking along icy Fifth

planed. He moved.

Many such stories about him exist.
Once, while walking along icy Fifth
Avenue he slipped, threw himself through
a flying somersavlt, landed on his feet,
unperturbed kept on walking.

At the Hotel Governor Clinton where
he now lives, if someone rings him up on
the telephone or knocks at his door and
he does not want to answer, he locks himself in the bathroom, turns the water
loudly on. He is very sensitive to sensory
stimuli. When he gets excited, blinding

"His father, a Greek clergymo-trator his mother, Groupin Manile, a Serarun inventees of household thrusana)jigs. "Her fineers were still nimible ensoult to the three knots in an eyelash" when she was past 60. Dr Tesla migrated to the U.S. in 1854 to work for Thomas Alia I doon whom he soon quit. His naturalization paiers he keeps in a safety box, his scientific medals and degrees in ald truals and cupbardes.

lights flash through his mind. He retreats to hed. A hielong bachelor, habitually he goes to bed at 5 30 a.m., rises at 10 30 a.m. But he does not deep the whole period. Proudly, yet almost plaintively, he explain. "I roll around and work on my problems."

Sen for Ju

Sen for Ju

Unbelievable news came last week from the Kyoto University Observatory at Kyoto, Japan the discovery of a new planet it 1000 miles in diameter and only 180 000 000 miles from the earth! No planet so large and near (the earth's diameter is 7 918 mi, its distance from the sun 92 900,000 mi) could exist beyond modern astronomers' knowledge They long ago would have spied it with their telescopes, if not with their unaided eyes. Or they would have spied it with their telescopes, if not with their unaided eyes. Or they would have calculated its existence, as the late Pereival Lowell calculated the existence of the unscen planet Pluto (Time, June 2, 1930) from the perturbations it caused in the orbits of the known planets. Questioning cables went to Japan.

Kaname Nakamura of the Kyoto observatory staff, when his agitation subsided was able to trace a gross error A reporter had misrcad the Japanese pictureword which described the Japanese pictureword which described the hew heavenly lody. The symbol for ten, or jn, is approximately that of the mathematical plus sizn (+)! for 1000 or 510, approximately that of the mathematical plus sizn (+)! for 1000 or 510, approximately that of the mathematical plus sizn (+)! for 1000 or 510, approximately that of the mathematical plus sizn (+)! for 1000 or 510, approximately that of the mathematical plus sizn (+)! for 1000 or 510, approximately that of the mathematical plus sizn (+)! for 1000 or 510, approximately that of the mathematical plus sizn (+)! for 1000 or 510, approximately that of the mathematical plus sizn (+)! for 1000 or 510, approximately that of the housand-ood other planetoids (Time, March 24, 1930).

CINEMA

The New Pictures

The New Pictures

A Woman of Experience (RKO-Pathé) Formula for spy stories a shady hady enters government service in wartime and is assigned to make friends with an enemy spy. She also falls in love with an aristocratic naval officer. The crisis comes when she saves the life of the naval officer by outwriting the enemy spy. Few spy stories vary this formula greatly. A II oman of Experience varies it not at all. Spy stories are currently favored by producers as a measuring stick for actresses who seem capable of being built up into a resemblance to Greta Garbo (Mysterious Ludy). Helen Twelvetrees is charming low-voiced auburn-haired but she lacks the exotic numbness of Garbo, Marliene Diccrich et al. Her quet and intelligent acting leaves the melodrama plausible but not exciting.

The Secret Call (Paramount) is mainly The Secret Call (Faramount) is mainly notable because its leading lady, Peggy Shannon, is being publicized as the successor to itty Clara Bow, whom she replaced in this pacture when Actress Bow became "indisposed."

Sturrt Walker, able technician of Indianapolis and Cincinnati stock companies, has handled the story well but shows his unfamiliarity with the cinema by not movement.



Liberty Mag., 1932 To the



PRINCESS ALEXANDRA KROPOTKIN

A MONG the new books I like particularly Martha Ostenso's Prolegue to Love. The sugged northern country of British Columbia interested me and the strength of the story is unusual, I thought. (Published by Dodd, Mead.)

Interest formed of the former of the former of the second of the second

No other mole could inspire such thrift!

MET a tail blonde at a recent tea party. I didn't hear her name. I Judged her to be about thirty-five. A pancake hat perched on her curis the way hids put their hats on sometimes when they are being fanny. Her bab) blue dress clung too intimately to her figure, and she wore a large cheap-looking ornament at her throat—of imitation diamonds, I thought. Half an hour later I learned her name. She was a much advertised beauty, a woman of great wealth. I realized that her diamonds were real but so ostentations that they looked false.

And her actual age, I knew, was twenty-five, not thirty-five.

And her actual age, I knew, was twenty-five, not thirty-five.

With just a little dignity and taste she would have looked a youthful twenty-five. Her foolish pursuit of schoolgiff "kiddishness" added ten years to her ap-pearance.

HUGO GERNSBACK, EDITOR

H. WINFIELD SECOR, WANAGING EDITOR

[[[[[]]]]]]

Unknown Short Waves An Editorial By HUGO GERNSBACK

We are the instrumentality of short waves—

and day out. We use the instrumentality of short warrs to receive music and talk from the Antipodes, and for use them for dozens of our other requirements, day n and day out but, when it comes to the waves themselves, a book seared tight with seven seals.

So far, meet of our experimental and research work has been concerned with the generation and the effect of short waves, but what happens to these waves between the trummitting artenna and your receiving set is still a deep mystery

waves, but what happens to these waves between the trunsmitting arterna and your receiving set is still a deep mystery.

While we know in a general way that waves are reflected
by the re-called Kennelly-Heaviside and Appleton layers,
which y was rise to "skip effects," very little is known outside of this fact. We do know that the upper rarefled atmospheric strata reflect the radio waves, somewhat as a
curved migrar would reflect light, still, this statement does
not always hold true either, and other things are happening, most of which we do not understand as yet.
For instance, only recently, Signor Marconi on his
yacht "Electra" did some constructive experimental work
upon a 3/6-meter band. Normally, the effect of such a
wave abould not go beyond the horizon, because at these
ultra-short wavelengths, as scientists think, the waves asaume the phyrical characteristics of light, and therefore
cannot go beyond the horizon, any more than a searchlight
can go around the curve of the earth.

It is true that, as Marconi pointed out, light waves suffer
a certain amount of refraction, so that you actually can
see them a little below the horizon, but not much. This,
however, does not explain how Marconi could send and receive short waves over a distance of 160 miles, when a
light beam would not go more than fifty miles at the most.

We are, therefore, face to face with a new mystery of
short waves; since they do not seem to behave "according
to Hoyle." Something else happens here that we do not
understand. The chances are that at this point our good
friend Dr. Nikola Teela steps into the breach. For many
years, this illustrious savant, the most distinguished living
inventor of today, has claimed that all radio transmission,
whether on long or short waves, is not done by free waves
in space at all, but that it is done by currents transmitted
it appears age, how he explains transmission from an airplane to the ground,

Tesis stated that this is nothing but a condenser or capacity effect, wherein the ground was one plate and the plane another. This is not at all illogical, when it is considered that submarines can send and receive radio nessages while totally submerged; always providing that their aerials are highly insulated and are not short-circuited by the salt water. The same is the case in exploration of the deepest caves that have, as yet, been reached by man. There is no trouble in signalling to these caves, and transmission and reception is always remarkably easy.

When Marconi, therefore, now transmits ultra short waves beyond the horizon, you may be sure that the ground effect, or the so-called ground-advee, has a lot to do with it; and future experimental and scientific research into this field will no doubt affirm or reject the theory.

There is still a tremendous amount of experimental work to be done in the exploration of radio waves. It has always been a source of wonder to me why short-wave experimenters have not tried their hand at "underground reception." This means of reception was first tried out on a large scale by the late Dr. James Barris Rogers of Hyattsville, Md. All during the war, by means of buried insulated cables, which rested in trenches anywhere from 3 to 6 feet below the surface of the earth, Dr. Rogers was able to receive regularly European stations, work an almost total absence of static. He could even receive whe tations when a thunderstorm was raging overhead!

For those experimenters who reside in the country, I would suggest that they try their hand at winderground vacception for short waves. The trick is rather simple; all that is necessary is to bury a rubber-covered were in the ground, after digging a trench some 20 to 50 feet in length, and then cover the cable. This then is your new aerial. It should even be possible, today, to use a transposition serial with two feeder lines running in each direction, and bring the twisted cable into the set. This would do two things: it would no d

Mere is an extremely interesting field for the experi-menter who wishes to accomplish something worthwhile and who wishes to leave the beaten track. The editors would be pleased to hear from those who have made ex-periments in short-wave under-ground reception, and the results will, of course, be published for the benefit of all.

SPORT WAVE CRAFT IS PUBLISHED ON THE 5th OF EVERY MONTH This is the November, 1933, Issue-Vol. IV, No. 7. The next Issue Comes out November 5th

Editorial and Advertising Offices - 86-98 Park Place, New York City

Scientist Describes True Folsom Points'

Characteristics of These Interesting Relies of Ancient Americans Outlined in Reply to Requests From LITERARY DIGEST Readers

The article "Stone Relies of Oldest The article None Relies of Uldest Americans which appeared in The Littland Diess for June 9 attracted wide-spread attention and produced a flood of letters concerning the so-called Folsom points, man-made blades of chipped stone.

Many of the letters stated that the writers onco-seed similar specimens, and many sent samples or drawings. Examined by scientists of the Smithsonian Institution at Washington, less than S per cent of these were found to be really representative of the Folsom type. Con contrespondents expressed the opinion can there was nothing rare or different about such specimens; that they had been found by the hundreds on old Indian village sites in various parts of the country and had been pictured in many reports and publications. Dr. Frank H. H. Roberts, Jr., archeologist Wany of the letters stated that the writers

Dr. Frank H. H. Roberts, Jr., archeologist of the Bureau of American Ethnology of the Smithsonian Institution, to response to a request by Tree Liverary Digest, explains the matter as follows:

A true Folsom specimen is a thin, leaf-shaped blade. The tip is slightly rounded and the broadest part of the blade. A-B in the diagram, tends to occur between the tip and a line across the center of the face. A typical feature is a longitud nal groove extending along each face, C, about two-thirds of the length, which produces lateral ridges paralleling the edges of the blade.

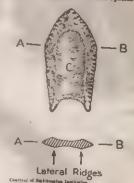
A cross-section of the object would give a hi-concave appearance as shown in the lower portion of the diagram. The base is concave, often with long, sharp, base points. There usually is a more or less fine marginal retouching, a secondary removal of small flakes, between the edges and the lateral ridge of the central groove. A cross-section of the object would give

Another feature frequently observed is that of smoothed edges around the base that of smoothed edges around the base and extending along the edges for about one-third the length of the blade. The usual material from which such objects were made was jasper, chert, or chalcedony. Some of the finest chipping of stone ever seen on New World specimens is to be found on the Folsom points.

All Features Are Present

The various features which characterize Folsom points may be found singly or in different comb nations on specimens orig-inating in several sections of the country. mating in several sections of the country, but unless all are present on each individual artifact it can not be considered an example of the type. Mere concavity of the base or a leaf like shape does not constitute, a Folsom point. These two elements are begarded by many as conclusive evidence that their specimens represent the type. Others rely entirely upon the presence of a longitudinal groove, even when occurring only one face, and make their identification regardless of the shape or

size of the blade. Hence the behef that innumerable examples are to be found. The points which became the pattern for the type were found near the small town of Folsom, New Mexico, in associa-tion with bones of an extinct species of



Characteristics of a true Folsom point

bison. The men studying the problem agree that the points belong to an early phase of aboriginal American stone-chipping, and are anxious to determine its extent and distribution.

Science Snap-shots

Heavy water, the oxide of denterium, or Heavy water, the oxide of desterium, or heavy hydrogen, will be produced on a commercial scale at about \$1 a drop at the Pennsylvania State College, it was announced recently. It will be sold at cost to scientists.

The new element No. 93, produced artificially a few weeks ago by the Italian physicist Eurico Fermi, may not be apknown in nature after all, Dr. O. Koblie has discovered an element much like it in pitchblende from the famous deposits in Czechoslovakia, whence came Mma. Curic's first radium-bearing orea. . . .

Susceptibility to infantile paralysis may be due to lack of resistance which possibly is inherited. This is indicated in studies just completed by Dr. W. Lloyd Aycock, Durector of Research of the Harvard Infantile Paralysis Commission. Twenty per cent, of the cases studied had a family history of the disease.

Two giant mossauria, thirty-five foot marine lizards which lived nearly 60,000,-000 years ago in the Cretaceous Sea, are being excavated from a deposit of bentonite, a commercial clay used in making cosmetics, near Winnipeg. Canada. These creatures were unable to travel on land, had flippers instead of feet, and beads four feet long. The skeletons will be sent to the National Museum at Ottawa.

Why "Death-Rays" Do Not Work, Tho Many Are Invented

Four or five times a year some inventor announces that he has produced a secret "death ray" which will kill whole armies at a distance, provide an invisible wall of force to protect a city or country, or short-circuit the electrical equipment of accorate materials will make the country of t aircraft, motor-vehicles, or tanks miles away. Never do these inventors reveal the secret; usually neither inventor or ray ever is heard of again.

The case is different with the latest announcement along this line. The distinguished, elderly Dr. Nikole Tesla, who made it, is no "nut inventor." He is responsible for the induction motor, the polyphase electric current, and is a pioneer in the study of high frequency transmission Yet, having had several days to think the matter over, engineers and scientists are skeptical for the reason that this inventor, like the others, refuses to divulge the secret, and moreover admits that he has not yet produced the ray; merely has

As a matter of fact, several kinds of lethal rays can be produced in the labora-tory, but when it comes to projecting them any effective distance natural units soon are reached. X-rays are deadly to

animals long subjected to massive doses, but unheard-of force would be required to

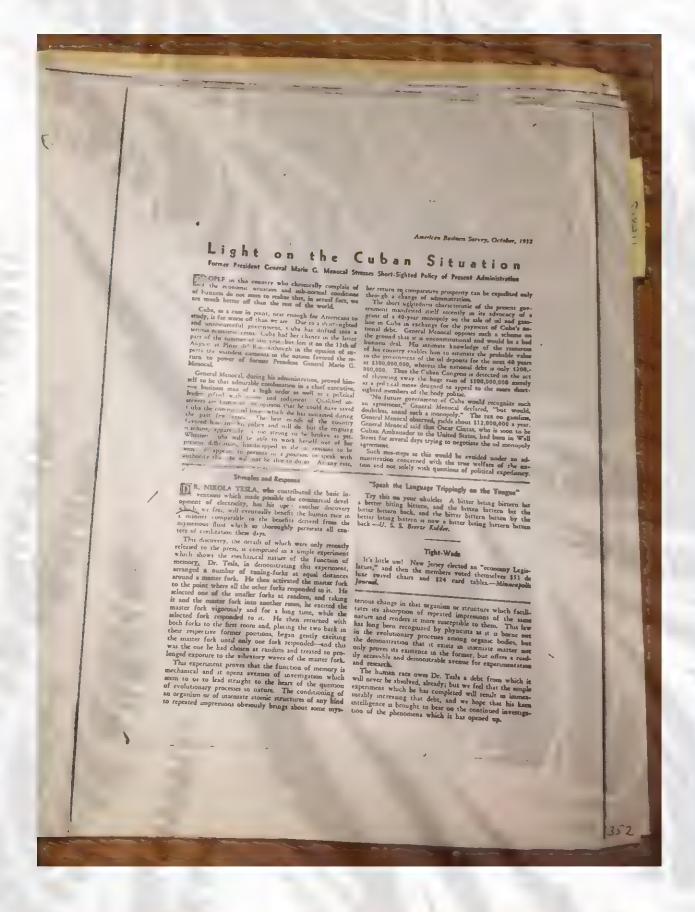


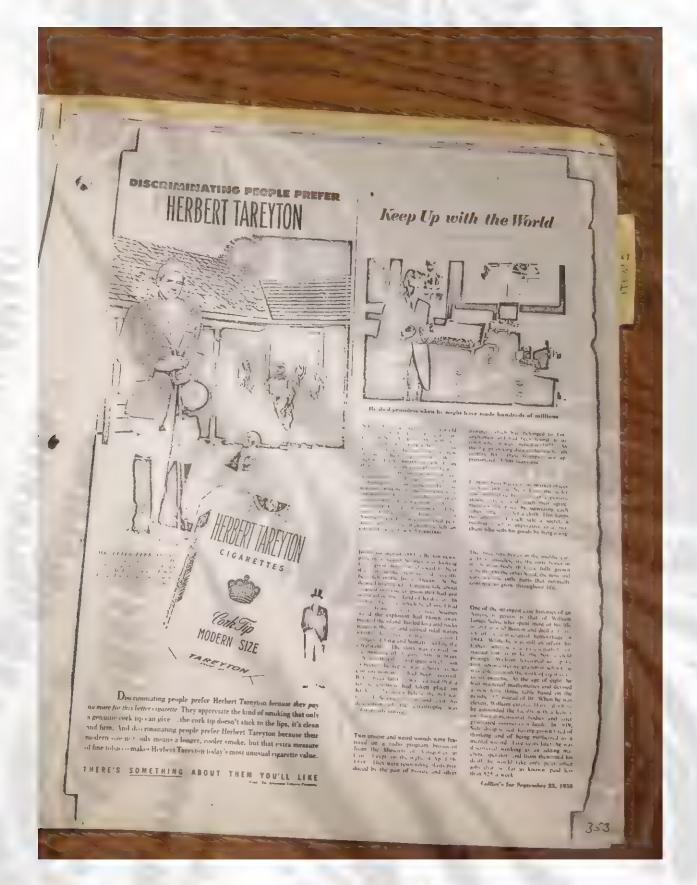
Dr. Nikola Teals

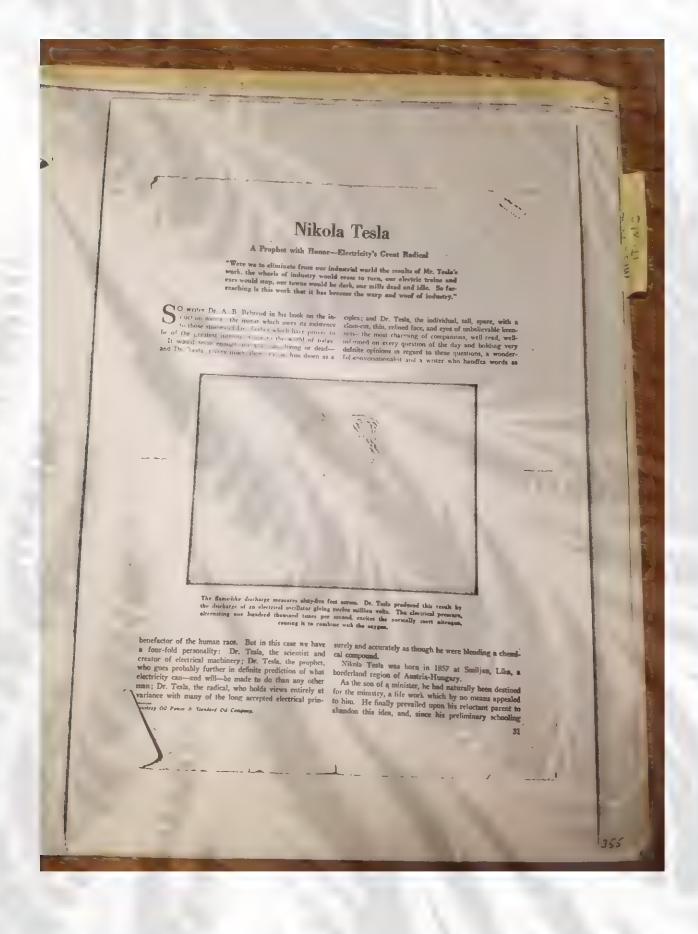
to be used, the object struck must be part of the circuit fit the ground is used to provide the return, how may the powerful bolt, supposing one strong enough could be generated, be prevented from following the shorter path and grounding itself on route? If electrical bolts.

There are many other possibilities, but every one canvassed by engineers has distinct limitations. It remains to be seen whether Doctor Tesla has something revolutionary enough to apset the known laws of physics. It is possible that he has.









TEAT

was over, to send him to Cratz in Austria to finish his studies at the Polytechine school with the object of be coming a professor of mathematics and physics. The idea of a professor-dup was abandoned, the next tear and Jesla turned by certification with the newly in troduced telephone but soon realized that his connection held no future for him. He then pushed on to Paris and became an electrical engineer with one of the large companies in the new science of electric lighting.

As early as 1882 he concentrated on embodying the



THE TEST & TELAUTOMATON

the Test's the action was more power, propelling and trenng machinery, and moreovous other accessories, all of which are controlled by transmitting from a distance, without wires, about triend oscillations to a creesit carried by the host and edjusted to respond only to those oscillations.

rotating field principle in operative apparatus. Then and there he would have published his ideas, given them to the world, had it not been for the solicitations of his friends in commercial circles who urged him to form a company to exploit this invention—destined to have so profound an influence on the development of future electrical machinery.

Mr Tesla met many Americans in France From them he learned of the real encouragement given in the United States to any inventor who could attain some new and practical result. It was a hold undertiking, but he did not bestrate. Again burning all his ships behind him, he came to America to go to work the very day he arrived at the Edison Works the goal of his ambition. It is easy to imagine the binefit and stimulus Tes'a derived from association with Mr Edison, for whom he always had-and still has the strongest admiration,

In this congenial atmosphere his work soon attracted so much attention that he was asked to join a company formed to develop and sell an arc-lighting system base i on some of his inventions. He brought this system to perfection and saw it placed on the market, but his thoughts were mostly concerned with his old discovery of the rotat

I. FNGINFER

Vol 52. No. 2

"It magnetic field principle for alternating current work, and the application of it in those induction motors which have now become known the world over.

Mr. Tesla stord y ractically alone in his convictions on the subject of the alternating current. Few engineers had ever used it or were even familiar with its essential features. As a matter of fact, Tesla himself did not learn his wito construct alternating current apparatus of even fair efficiency until alternating current apparatus of even fair efficiency in the demonstrated that Tesla's motors gave an efficiency equal to that of direct current motors. The final difficulty to be overcome in the construction of these motors was their adaptation to evisting circuits, which were all built for direct current in this country. This was successfully accomplished. The Westinghouse people ac, in red these justents and produced the motor, applying to different needs.

The first pajert given to the world on alternating currents was read by Mr. Tesla before the American limiting of Flectrical Engineers in New York, in May, 1888, at the arstingation of Thomas Comerford Martin and Professor Anthony. In connection with this paper, he exhibited motors that had been in operation long previous,



The efficiency of modern generators, such so these at Niagara Falls, has been made possible because of Dr Teals inventions.

and with which his belief that brushes and commutators could be dispensed with, was triumphantly proved to be correct.

In 1890 Mr Tes'a left Westinghouse and devoted himself to experimenting with alternating currents of very high potentials and frequencies. Through his thirst to penetrate into the unknown, he was rewarded with results of the most astonishing nature, such as the transmission of electrical energy throughout the earth without any wire, the invention of an apparatus for electrical oscillators of tremendous power, and the transmission of electrical en-

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crisy to any distance without wires. These though he mentions in an article which appeared in the Century for June, 1900, entitled "The Problem of Increasing Human Energy"—an article that proves Tesla to be one of the deepest thinkers of our time. These results he also set forth in a lecture in May, 1891 which may be said to have marked a distinct departure in electrical theory and practice.

May 18, 1912, Dr. Tesla was presented with the Edison Medal by the American Institute of Electrical Engineers in the auditorium of the United Engineering Societies Building, in New York City. This medal is awarded annually for "meritor, us achievement in electrical scripce, electrical engineering or the electrical arts." Dwa commit tee of twenty four members of the American Institute of Electrical Engineering.

Liectrical Engineering.

It might be said of Dr. Tesla that he is a fundamentalist in electricity, digs down to the costs and essences of his chosen subject, refuses to accept an inclusion without the closest scrutiny (criain) and his views on electricity are radical for example of the electron as popular the related by views of the closest scrutiny critical for the electron as popular that the start does not be stored by views on the closest scrutiny critical screens of the electron as popular that the start does not be stored by views on the closest scruting that the start does not be stored by views on the closest scruting that the start does not be stored by views on the start does not be started by views on the start does not be started by views on the starte

Cute for an electron

Perhaps he most outstanding disagreement with generally accepted these has to do with Hertz waves. De Tesla claims that adiostransmitters, as now used, who not entit Hertz waves as some only believed at using of sound. He bases this belief on the fact that as early as level be decommended that the elber we again which can be transmit only waves of sound, that is—such waves as are alternately propagated to alternate compressions and rarefactions of the medium in which transverse waves are absolutely impossible. He claims that Dr. Hertz, in his celebrated experiments, mixtook sound waves for transverse waves and that this illusion has been constantly kept up by his followers and has greatly retarded the development of the wireless art. As ason as experts become convinced of this fact they will find a sintable explanation of all the puzzling phenomena of the so-called radio

Again, Dr. Tesla does not believe in the popular idea of deriving motive power from the disintegration of atoms or change of elements. He holds that radio-activity is due, not to forces in the substances themselves, but to a cosmic ray, the discovery of which he announced in 1897. In simple language, an element like radium emits radiations merely because the cosmic ray impinges upon it, thus producing these secondary effects.

He believes that television inventors are on the wrong track and that television in the future will have all the complicated parts located in the transmitting or central, station and that the receiver of the picture will have practically nothing but a screen, together with a wave, or station selector.

The amazing thing about Dr. Tesla is that he seems to have always been, and still is, ahead of his time. For example: the principle of neon lamps, as they are now used, was discovered by Dr. Tesla thirty years ago, and he even had in operation at that time filamentless, gas-

filled electric lamps standardized to 50 candle power. He predicts that the day of the filament lamp is over and it will be replaced by the light from properly gas filled tubes, which will be more economical, infinitely more lovely, and last forever.

Nikola Tesla's induction motor, high voltage trans-



Illustrating the capacity of the oscillator for ereacting a great electronal movement.

The ball is covered with a pollished metallic coming of 20 or ft. of surface, and represents a largereservor of electricity, and the unverted its pass
underneath, with a sharp rim, a big opening
through which the electricity can escape before
folling the reservoir. The quantity of electricity
set in meavement as go great that, although most
off it exappe through the rim of the pan or open
ing provided, the ball or reservoir is neverthelms
alternately empired and filled to overflowing—
evidenced from the discharge excepting on the top
of the hall one hundred and filly thousand times
per second.

former, and system of alternating current transmission have brought him fame and fortune. Among his inventions which are little known to the public are a radical new apparatus for the wireless transmission of power, brigdeless turbines, aeroplanes that rise and descend vertically and the Tesla viscosity specdometer which registers the speed in miles per hour. This speedometer is based on the fact that when one disc is driven by a flexible shaft from the engine transmission the drag of the air particles betwen the revolving disc and a closely positioned second disc is such that the latter will be turned through part of a circle proportional to the speed of the driven disc. It is only necessary, therefore, to calibrate the second disc in revolutions per minute or miles per hour, to have a perfect speed indicator.

But it is Dr Tesla, the prophet, who makes us catch our breath in awe—since he is a prophet districtly with

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Dr. Festa bases his wast amount of work on wireless transmission and for eighton, and the marketing plenomenon of terrestrain reso ance, which he resolvered in 1879 in I on his mage ving transmitter. He considers the whole earth as a higg wiree or conductor, and, having deternined the constants in electrical mins, he has decured the proper wireless transmitter needed to set the globe into powerful electrical vibrations. According to this theory if we desire to operate lights or motors, all we have toots of to connect an electrical capacity, such as an antenna, or other conductor, through the apparatus. If this theory is correct, and tew engineers will make the positive datament that it is not, we shall have no more power transmission lines; we shall have an electrical capacity, in the

honor in his adopted country, a prophet whose predictions are continually coming true.

Dr. Testa bases his vast amount of work on wireless transmission and reciption, and the markeous phenomenon of terrestrial reconance, which he is covered in 1879, into on his make my gettermine the markeous phenomenon has make my gettermine the markeous phenomenon of terrestrial reconance which he is covered in 1879, into on his make my gettermine the markeous phenomenon in the control of terrestrial reconance of the carth, will pack up he described with this article general so that the current may be measured and paid for in the usual way to the carth as a high warre-or conductor, and have determined to the carth will pack up he described the carth will pack up he described transmission and tree prior and the markeous phenomenon of terrestrial reconance.

may be measured and paid for in the usual way to the central station owners. Dr. Tesla produced artificial lighting displays in his colorado laboratory forty years ago, that have probably never since been equalled. Hundreds of patents cover his mixentions but thousands of his ideas have never been parented at all and are recorded only in his private files. No one knows what he will conceive next, but whather tit is, it will probably be sound in every principle. Tesla's name will 400 down to posterity as one of the greatest inventors and electrical discoverers of all time.



A Testa experiment illimitating an industrie effect of an electrical oscillator of great power A Total experiment illustrating an industrice test of an electrical oscillator of gross power. Three ordinary instandescent lamps are lighted to fell candle power by currents induced us a linux loop of single were forming a equare of fifty feet each inde, which includes the lumps, and which is 100 feet distant from the primary circuit energized by the oscillator. The loop also includes an electrical conclusion, and is exactly atmixed to the videntions of the oscillator, which is worked at less than five per cent of its total expectity.

Philosophy of Hu Shih, a Scholarly and Travelled Chinese

"To me that civilization is materialistic which is limited by matter and incapable of transcending it, which feels itself powerless against its material environment and fails to make the full use of human intelligence for the conquest of nature and for the improvement of the conditions of man . .

"On the other hand, that civilization which makes the

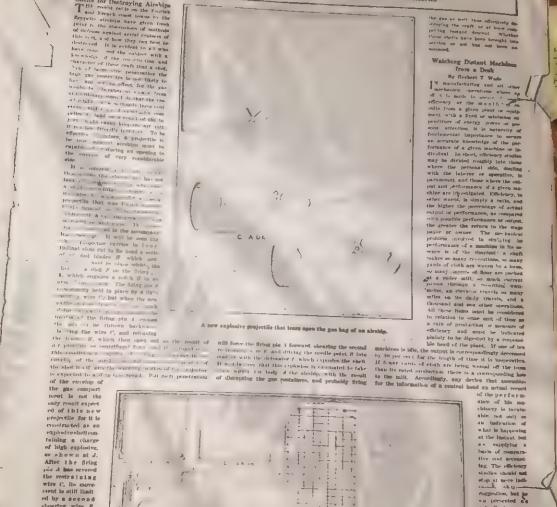
fullest possible use of human ingenuity and intelligence in search of truth in order to control nature and transform matter for the service of mankind, to liberate the human spirit from ignorance, superstition, and slavery to the forces of nature, and to reform social and political institutions for the benefit of the greatest number—such a civilization is highly idealistic and spiritual." - 1.5 miles

Inventions New and Interesting

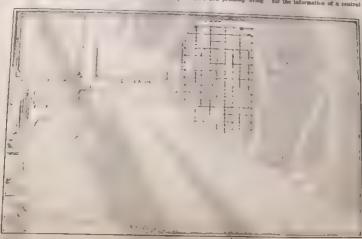
Simple Patent Law . Patent Office News. Notes on Trademarks

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of the performance of the performance of the measure of the measur entiturism of see motion at one point or another along the line. To recure this ele-mentary datum, and place is at the disposal of a cen-



Productographo in the manager's office that record the exact amount of work done by the different machines throughout the factory.

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Defending 13, 1918

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Nikola Tesia's Fountain

To a carious fact that, old as fountains are, they have remained onesotially me changed to principle for control and the season of the control and the season of the season of the capture of make these beautiful but engineers that necessary the season of the same season of the season o

overflows in a natature waterflow of the penaltre sine.

As the circulation is extremely rapid, the total quantity of water required in comparatively small, should one renth of that delivered jet minute will be presently surficient. In this fountial then, we find a given mans of water projected by the use of only such power as is required to lift it from its normal level through a refailtrely short puse to that from which it overflows and descends as a waterful or cannode. In that sense it is a ratical departure from historic fountains.

The apparatus not only makes the becoming of insection impossible, but is to a sense a very efficient trap.

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proper of trees by checkerous and the same of the same

boons tournor. Yet before the managers eye the complete activity of the plant is apparent.

Again in other establishments the number of lottless filled, the number of describe builton, the number of cases, the mount of liquid paradiaj into a tank; the amount of cases which lots the coal viewing, the number of accrements of a design bucket, and, in fact, all design information immediately and quantitatively is recorded.

In all efficiency studies knowledge of conditions and performance is the first condition, and with this accumulated by a device which indicates also the production, the efficiency engineer or super-intendent can proceed to better his output.

put. Realthing as he can at a glance, that machine No. 10 was file for two boars, it is possible to fivestigate the reason and to freely explain such that the future, whether they are the result in the future, whether they are the result of personal or mechanical causes. If another markine supplies but a fraction of the output of its neighbor it does not take every bug for the efficiency engineer to determine the fact and to change conditions.

them.

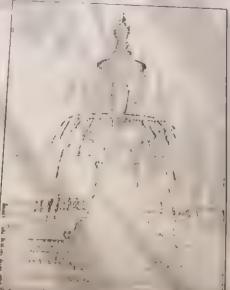
The reco. In are available for analysis either by the managers of the plant or by trained autistic experts, and the logical development would seem to be a central office of efficiency where a superintendent would analyse not once a year, but since an hour or at even a less interval what is happening within the walk of his factory, or, in fact, within seems affiled establishments. So far the system has teen made with twenty indicators, but there seems to be no limit as to fix application either in extent or in ranga. The



Muchine that seals one thousand envelops per misute.

the knowledge on which mechanical efficiency m

The Envelop Scaler of the Penason Office A R may well be sanctived, the envelop netpet of a circumstance of the Plahoureannel Office of the United Ratios Present of the Plahoureannel Office of the United Ratios Present of the Washington, B. C., is very large indeed, and there has been a demand for a machine of large capacity for sextling envelope, Fertilizing this need an most accordance of the different of the built of a machine of the type capacity, undertook in built of a machine of the type of the capacity of the way sue sector. The capacity of the

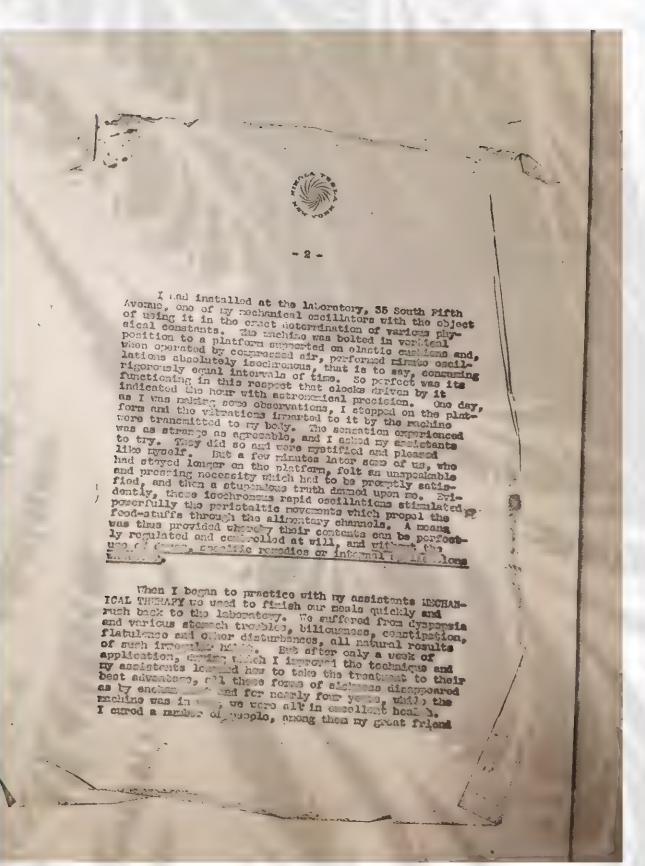


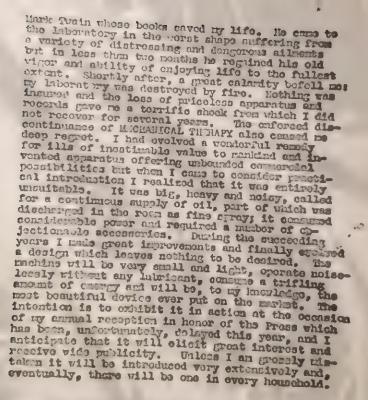
Nihola Teala's fountain, in which remarkable results are obtained with little water.



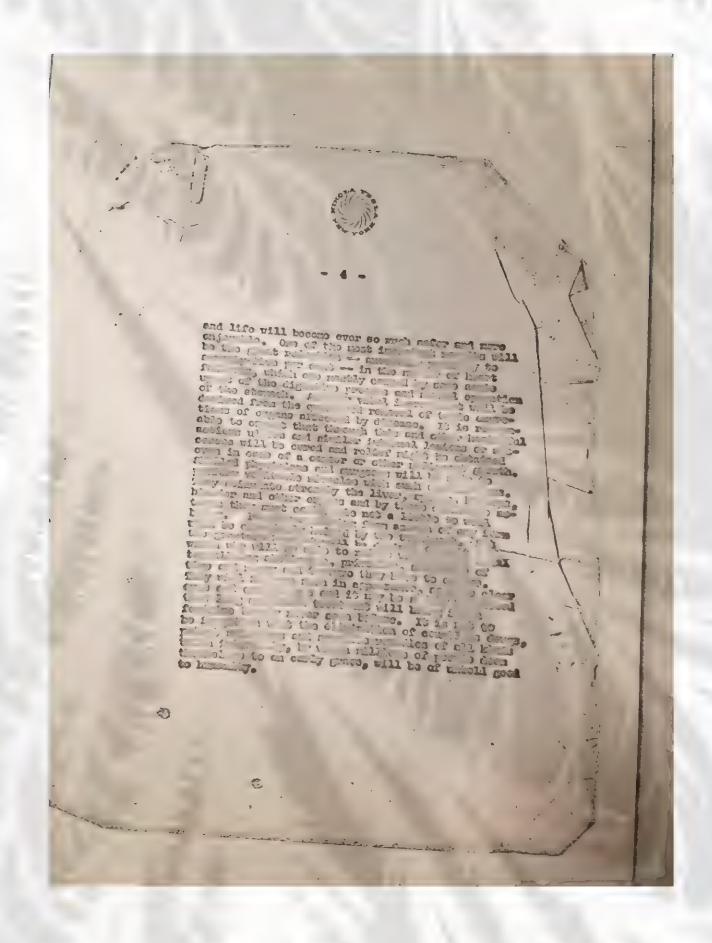


HECHANICAL THERAPY By MIKULA TESLA In color to carry a clear idea of the simifferent pensable to make a brief statement regarding ELECTRICAL Pifty years ago, while investigating high from any currents dovologed by me at that time, I down the from any produced corrected effects of the first they great people littles in malical treatment. It is a factor to be a first here and apprinced very united to the first here and apprinced very united to the first here and apprinced very united to the first here and apprinced that he is in the same discovery, a heated constructory relation to prince they was storted. The French, eager to honer their countries any carlier publication. Resolved to the several ferror may carlier publication. Resolved to the several for the cating my claim, I went to faris, where I met Ir. D'arror allies present chara discount in completely and I at adapting the first in his deponstrations. The final judgment is left to postority. posterity. Since the bardaning, the growth of the new art and industry has been here all, so I marriacture to traditions are new in the coling has been and of sets. If y millions are new in the throughout the world. The converts for ichiely there is properly an ichiel to de for the human news are in the property of the coling that is healthand at the chief for the lamb of the coling the coling and in the coling that is a real form of the coling and the property of the coling and the coling an





the practical application of HECHANICAL THERAPY through my oscillators will prefer mily affect human life. By insuring perfect religity of evacuations the body will function become in every respect



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MY INVESTIONS

by Bikole Toole.

VI. The Art of Tolautomatics.

How Tesla's Lind Recuperates. No subject to which I have ever devoted myself has called for such consentration of mind and atrained to so dengerous a degree the finest fibers of my brain as the system of which the Magnifying Transmitter is the foundation. I put all the intensity and vigor of youth in the development of the rotating field discoveries, but those early labors were of a different character. Although stronuous in the extreme. they did not involve that keen and exhausting discernment which had to be exercised in attacking the many puszling problems of the wireless. Despite my rare physical endurence at that period the abused nerves finally rebelled and I suffered a complete collegee, just as the consummation of the long and difficult task was almost in eight. Without doubt I would have peid a greater penelty later, and very likely my osreer would have been prematurely terminated, had not providence equipped me with a safety device, which has seemed to improve with advancing years and unfailingly comes into play whom my forces ere at an end. So long as it operates I am safe from danger, due to overwork, which threatone other inventors and, incidentally, I need no vacations

which are indispensable to most pooble. When I am all but used up I simply do as the darkies, who "naturally fall asleep while white folks worry". To venture a theory out of my sphere . the body probably accumulates little by little a definite quantity of some toxic agent and I sink into a nearly lethargie state which laste half an hour to the minute. Upon awakening I have the sensation as though the events immediately praceding had occurred very long ago, and if I attempt to continue the interrupted train of thought I feel a veritable mental nauses. Involuntarily I then turn to other work and am surprised at the frashness of the mind and anse with which I overcome obstacles that had baffled me before. After weeks or menths my passion for the temporarily abandened invention returns and I inveriably find answers to all the vexing questions with scarcely any effort.

experience which may be of interest to students of psychology.

I had produced a striking phenomenon with my grounded transmitter and was endeavoring to ascertain its true significance in relation to the currents propagated through the earth. It seemed a hopeless undertaking and for more than a year I worked unremittingly but in vain. This profound study so entirely absorbed me that I became forgetful of everything class, even of my undermined health. It lest, as I was at the point of breaking down, nature applied the preservative indusing lethal eleep.

Regaining my senses, I realized with consternation that I was

unable to visualize eccaes from my life except those of infercy, the very first ones that had entered my consciousness. Curiously enough, these appeared before my vision with startling distinctness end efforded me welcome relief. Hight efter night, when retiring, I would think of them and more end more of my previous existence was revealed. The 1 age of my mother was always the principal figure in the spectacle that slowly unfolded, and a consuming desire to see her again gradually took possession of me. This feeling grew so strong that I resolved to drop all work and satisfy my longing. But I found it too hard to break away from the laboratory and several months elapsed during which I had succeeded in reviving all the impressions of my past life up to the sp.ing of 1692. In the next picture that came out of the mist of oblivion, I sow myself at the Hotel de la Paix in Paris just coming to from one of my peculiar sleeping spells, which had been caused by prolonged exertion of the brain. Imagine the pain and distress I folt when it floshed upon my mind that a dispatch was handed to me at that very moment beering the end news that my mother was dying; I remembered how I made the long journey home without an hour of rest and how she passed away after weeks of agony! It was especially remerkable that during all this period of partially obliterated memory I was fully alive to everything touching on the subject of my research. I could recall the smallest details and the least insignificant observations in my experiments and even recite pages of text and complex mathematical formulae.

My belief is firm in a law of compensation. The true rewards ere ever in proportion to the labor and seerifices made. This is one of the reasons why I feel certain that of all my invontions, the Magnifying Transmitter will prove most important and valuable to future generations. I em prompted to this . rediction not so much by thoughts of the commercial and industrial revolution which it will surely bring about, but of the humaniturien consequences of the many schievements it makes possible. Considerations of mere willity weigh little in the belence scainst the higher benefits of civilization. We are confronted with portentous problems which can not be solved just by providing for our meterial existence, however abundantly. On the contrary, progress in this direction is fraught with bezards and perils not less menacing than those born from went and suffering. If we were to release the energy of atoms or discover some other way of developing cheap and unlimited power at any point of the globe this accomplishment, instead of being a blessing, might bring discater to menkind in giving rise to dissension and anarohy which would ultimately result in the enthronement of the heted regime of force. The greatest good will come from technical improvements tending to unification and harmony, and my wireless transmitter is preëminently such. By its mesne the human voice and likeness will be reproduced everywhere and factories

driven thousands of miles from waterfalls furnishing the power; serial machines will be propelled around the earth without a stop and the sun's energy controlled to create lakes and rivere for motive purposes and transformation of arid deserts into fertile land. Its introduction for telegraphic, telephonic and similar uses will automatically cut out the statics and all other interferences which at present impose narrow limits to the application of the wireless. This is a timely topic on which a few words might not be smiss.

Toels Page "Static" Mer Vigorously.
During the page decade a number of people have arrogantly claimed that they had succeeded in doing away with this impediment. I have carefully examined all of the arrangements described and tested most of them long before they were publicly disclosed, but the finding was uniformly negative. A recent official statement from the U. S. Mavy may, perhaps, have taught some beguilable news editors how to appraise these announcements at their real worth. As a rule the attempts are besed on theories so fallacious that whenever they come to my notice I can not help thinking in a lighter vein. Quite recently a new discovery was heralded, with a desfening flourish of trumpets, but it proved another case of a mountain bringing forth a mouse. This reminds me of an exciting incident which took place years ago when I was conducting my experiments with currents of high frequency. Steve Brodie had just jumped off the Brooklyn Bridge. The feet has been vulgerized since by imitators, but the

first report electrified New York. I was very impressionable then and frequently spoke of the during printer. On a hot afternoon I felt the necessity of refreshing myself and storped into one of the popular thirty thousand institutions of this great City where a delicious twolve per cent beverage see served which can now be had only by making a trip to the poor and devastated countries of Europe. The attendance was lerge and not over-distinguished and a metter was discussed which gave me an admirable opening for the careless remark: "This is what I said when I jumped off the bridge". So sooner had I pricered these words than I felt like the companion of Timotheus in the poem of Schiller. In an instant there was s pandemonium and a dozen volues cried: "It is Brodie!" I threw a quarter on the counter and bolted for the door but the crowd was at my heels with yells: "Stop, Steve!" which must have been misunderstood for many persons tried to hold me up as I ren frontically for my haven of rofuge. By darting around corners I fortunately managed - through the medium of the fire-escape - to reach the laboratory, which I threw off my coat, camouflaged myself as a hard working blacksmith, and started the forge. But these precentions proved unnecessary; I had eluded my pursuers. For many years afterward, at night, when imagination turns into spectres the trifling troubles of the day, I often thought, as I tokeed on the bed, what my fate would have been had that mob caught me and found out that I was not Steve Brodie;

Now the engineer, who lately gave an account before a technical body of a novel remety against statics based on a "heretofore unknown low of neture", seems to have been as reckless as myself when he contended that these disturbances propagate up and down, while those of a transmitter proceed along the earth. It would mean that a condensor, as this globe, with its gaseous envelop, could be charged and discharged in a manner quite contrary to the fundamental teachings propounded in every el. mental text-book of physics. Such a supposition would have been condemned as erroneous, even in Franklin's time, for the facts bearing on this were then well-known and the identity between atmospheric electricity and that developed by machines was fully established. Obviously, netural and ertificial disturbances propagate through the carth and the air in exactly the same way, and both set up electro-motive Coross in the horizontal, as well as vertical. sence. Interference can not be everence by any such methods as wore proposed. The truth is this: In the air the potential increases at the rate of about fifty volta per foot of elevation, owing to which there may be a difference of pressure smounting to twenty, or even forty thousand volts between the upper and lower ends of the antenna. The masses of the charged atmosphere are constantly in motion and give up electricity to the conductor, not continuously but rather disraptively, this producing a grinding noise in a sensitive telephonie

receiver. The higher the terminel end the greater the spece encompassed by the wires, the more pronounced is the effect, but it must be uncerstood that it is purely local end hee little to do with the real trouble. In 1900, while porfecting my wireless system, one form of spinratus comprised four ntennae. These were carefully calibrated to the came freonency and connected in multiple with the object of magnifying the ection, in receiving from eny direction. Then I decired to ascertain the origin of the transmitted impulses, .eco disconsily situated pair was put in series with a primary coil energising the detector circuit. In the former case the sound was loud in the tolophone; in the letter it censed, as expected, the two antennes neutralizing each other, but the true statics menifested themselves in both instances and I had to device special preventives embodying different principles. By employing receivers connected to two points

of the fround, as suggested by me long ago, this trouble ceused by the charged air, which is very serious in the structures as now built, is mullified and besides, the liability of all kinds of interference is reduced to about one-half, because of the directional character of the circuit. This was perfectly self-evident, but came as a revelation to some simple-minded wireless folks whose experience was confined to forms of apparatus that could have been improved with an exe, and they have been disposing of the bear's skin before

killing him. If it were true that strays performed such entice.

it would be easy to get rid of them by receiving without seriels.

But, as a matter of feet, a wire buried in the ground which, conforming to this view, should be absolutely immune, is more susceptible to certain extraneous impulses than one placed vertically in the air. To state it fairly, a slight progress has been made, but not by virtue of any particular method or device. It was achieved simply by discarding the enormous structures, which are bed enough for transmission but wholly unsuitable for reception, and adopting a more appropriate type of receiver. As I pointed out in a previous article, to dispose of this difficulty for good, a radical change must be made in the system, and the second

It would be calamitous, indeed, if at this time when the art is in its infancy and the vest majority, not excepting even experts, have no conception of its ultimate possibilities, a measure would be rushed through the legislature making it a Government monopoly. This was proposed a few works ago by Secretary Daniels, and no doubt that distinguished official has made his appeal to the Senate and House of Representatives with eincore conviction. But universal evidence unmistakebly shows that the best results are always obtained in least thrul commercial compotition. There are, however, except-

development. In the first place it offers prospects immessurably greator and more v tal to bettorment of human life than any other invention or discovery in the history of man. Then again, it must be understood that this wonderful art has been, in its entirety, evolved here and can be called "American" with more right and propriety than the telophone, the incondescent lump or the seropleme. Enterprising press agents and stock jobbers have been so successful in spreading misinformation that even so excellent a periodical as the Scientific American accords the chief credit to a foreign country. The Germans, of course, gave us the Hortz-waves and the Russian, English, French end Italian experts were quick in using them for signalling purposes. It was an onvious application of the new agent and eccomplished with the aid classical and unimproved induction coil-scarcely anything more than another kind of heliography. The radius of transmission was Very limited the results etteined of little value, and the Herts oscillations, as a neonr for conveying intelligence, could have been advantageously replaced by sound-waves, which I advocated in 1891. Moreover, all these stiempts were made three years after the basic principles of the wireless system, which is universally employed today. and its potent instrumentalities had been clearly described and developed in /merica. He trace of those Hertsian appliances and methods remains today. We have proceeded in the vorg opposite direction and what has been done is the product of the brains and efforts of citisens of this country. The fundamental patents have expired and the opportunities are open to all. The chief argument of the Secretary is based on interference. According to his statement reported in the New York Hereld of July 29th, signals from a powerful station can be intercepted in every village of the world. In view of this fact, which was demonstrated in my experiments of 1900, it would be of little

light on this point, I may mention that only recently en odd looking gentlemen called on me with the object of enlisting my services in the construction of world transmitters in some distant land. "We have no money," he said, "but carloade of solid gold and we will give you a liberal amount." I told him that I wanted to see first what will be done with my inventions in imerics and this ended the interview. But I am satisfied that some dark forces are at work, and as time goes on the maintenance of continuous communication will be rendered more difficult. The only remedy is a system immune against interruption. It has been perfected, it exists, and all that is necessary is to put it in operation.

The terrible conflict is still uppermost in the minds and perhaps the greatest importance will be attached to the Magnifying Transmitter as a machine for attack and defense, more particularly in connection with teleutomatics. This invention is a logical outcome of observations begun in my boy-hood and continued throughout my life. Then the first results were published, the Electrical Review stated editorially that it would become one of the most potent factors in the advance and civilization of mankind. The time is not distant when this prediction will be fulfilled. In 1898 and 1900 it was offered to the Government and might have been adopted were I

one of those who would go to Alexander's shepherd when they want something from Alexander. At that time I really thought that it would abolish war, because of its unlimited destructiveness and elimination of the personal element of combet. But while I have not lost faith in its potentialities, my views have changed since.

Nar can not be avoided until the physical cause for its recurrence is removed and this. in the last analysis, is the vest extent of the planet on which we live. Only through annihilation of distance in every respect as, the conveyence of intelligence, transport of passengers and supplies and transmission of energy will conditions be brought about some day, insuring permanency of friendly relations. What we now want most is closer contact and better understanding between individuals and communities all over the earth, and the elimination of that fanatic devotion to exalted ideals of national egoism and pride which is always prome to plunge the world into primeyel berberism and strife. He League or perliamentary act of any kind will ever prevent such a calemity. These are only new devices for putting the weak at the mercy of the strong. I have expressed myself in this regard fourteen years ego when a combination of few leading governments - a sort of Holy Alliance - was advocated by the lete Andrew Carnegie, who may be fairly considered as

the father of this idea, having given to it more publicity and then snyhody else impetus prior to the efforts of the President. Shile it can not be denied that such a past might be of material advantage to some less fortunate peoples, it can not attain the chief object sought. Peace can only come as a natural consequence of universal enlightenment and merging of races, and we are still for from this bliesful realization. As I view the world of today, in the light of the gigantic struggle we have witnessed, I am filled with conviction that the interests of humanity would be best served if the United States remained true to its traditions and kept out of "entangling elliances". Situated as it is, geographically, remote from the theaters of impending conflicts, without incentive to territorial aggrandisement, with inexhaustible resources, and immense population thoroughly imbued with the spirit of liberty and right, this country is placed in a unique and privileged position. It is thus able to exert, independently, its colossal strength and moral force to the benefit of all, more judiciously and effectively, than as member of a league.

The Mechanistic Theory of Life.

In one of these biographical shetches, published in the Electrical Experimenter, I have dwelt on the circumstances of my early life and told of an affliction which compelled no to unremitting exercise of imagination and self-observation. This mental activity, at first involuntary under the pressure of illness and suffering, gradually became second nature and led me finally to recognize that I was but an automaton devoid of free will in thought and action and merely responsive to the forces of the environment. Our bodies are of such complexity of strusture the motions we perform are so numerous and involved, and the externe. impressions on our sense organs to such a degree delicete and elugive that it is hard for the average person to grasp this fact. And yet nothing is more convincing to the trained investigator than the mechanistic theory of life which had been, in a measure, understood and propounded by Descartee three hundred years ago. But in his time many important functions of our organism were unknown and, especially with respect to the nature of light and the construction and operation of the eye, philosophers were in the dark. In recent years the progress of scientific research in these fields has been such as to leave no room for a doubt in regard to this view on which many works have been published. One of its ablest and most eloquent exponents is, perhaps, Felix Le Dentse, formerly assistant of Pasteure. Prof. Jacques Loeb has performed remarkable experiments in helictropism, clearly establishing the controlling power of light in

lower forms of organisms end his latest book "Formed Movemente" is revelatory. But while men of science accept this theory simply as any other that is recognized, to me it is a truth which I hourly demonstrate by every set and thought of mine. The consciousness of the external impression prompting me to any kind of exertion, physical or mental, is ever present in my mind.

Only on very rare occasions, when I was in a state of exceptional

concentration, have I found difficulty in locating the original impulses for by far prester of human beings are never aware of I for that is passing around and within them, and millions fall victims of classes and die prematurely just on this account. The commonest, every-

day occurrences appear to them mysterious and inexplicable. One may feel a sudden wave of sadness and rake his brain for an explanation when he might have noticed that it was caused by a cloud cutting off the rays of the sum. He may see the image of a friend dear to him under conditions which he construes as very peculiar, when only shortly before he has passed him in the atreet or seen his photograph somewhere. When he loses a collar button he fusses and swears for an hour, being unable to visualize his previous actions and locate the object directly. Deficient observation is merely a form of ignorance and responsible for the many morbid notions and foolish ideas prevailing. There is not more than one out of every ten persons who does not believe in telepathy and other psychic manifestations, spiritualism and communion with the dead and who would refuse to listen to

willing or unwilling defeivers. Just to illustrate how deeply rooted this tendoncy has become even smong the clear-headed American population, I may mention a comical incident. Shortly before the war, when the exhibition of my turbines inithic City elicited widespread comment in the technical papers. I anticips ted that there would be saves emong manufacturers to got hold of the invention and I had particular designs on that can from Detroit who has an uncanny faculty for accumulating millions. So Rene was I that he would turn up some day, atxanguarries that I declared this as certain to my secretary and essistants. Sure enough, one fine morning a body of engineers, representing the Ford Motor Company presented themselves with the request of discussing with me an important project. "Didn't I tell you?" I remarked triumphantly to my employes, and one of them said, "You are wonderfuly Mr. Tesla, everything comes out exectly as you predict." As soon as these statinguished men were scated I, of course, immediately began to extol the wonderful features of my turbine when the spokesman interrupted me and said, "we know all about this but we are on a special errand. We formed a psychological society for the investigation of payobic phenomena and we want you to join us in this undertaking." I suppose these engineers never knew how near they came to being fired out of my office.

COMPUTING STIRITISM.

Ever since I was told by some of the greatest men. of the time, leaders in science whose names are immortal, that

I am possessed of an unusual mind, I bent all my thinking faculties on the solution of great problems regardless of sacrifice.

For many years I endeavored to solve the enigns of death and watched eagerly for every kind of spiritual indication. But only once in the course of my existence have I had an experience which, momentarily, impressed me as supernaturel. It was at the time of my mother's death. I had become completely exhausted by pain and long vigilance and one night was carried to a huliding about two blocks from our home. As I lay helpless there, a thought that if my mother died while I was away from her bedelde she would surely give me a sign. Two or three months before I was in London in company with my late friend, Sir William Crookes, when spiritualism was discussed and I was under the full eway of these thoughts. I might not have paid attention to other men but was susceptible to his arguments es it was his epochal work on radiant matter, which I had read as a student, that made me embrace the electrical career. I reflected that the conditions for a look into the beyond were most favorable, for my mother was a woman of genius and particularly excelling in the powers of intuition. During the whole night every fiber in my brain was strained in expectancy, but nothing happened, and early in the morning I fell in a sleep or perhaps a swoon, and saw a cloud cerrying angelic figures of marvelous beauty, one of whom gased upon me lovingly and gradually assumed the features of my mother. The appearance slowly floated scrow the room and vanished and I was awakened by an indescribebly sweet song of many voices. In that instant a certitude, which no words can express, came upon me that my mother had died, And that was true. I have make where

Aunable to universized the tromendous weight of the painful knowledge. I received in advance and wrote a letter to Sir Villiam Grockes while still under the domination of these impressions and in poor bodily health. When I received I cought for a long time the external cause of this strange manifestation and, to sy great relief, I succeeded after many months of fruitless effort. I had seen the reinting of a celebrated artist, representing allegorically one of the seasons in the form of a cloud with a group of angels which seemed to actually float in the air, and this had struck me forcefully. It was exactly the same that appeared in my dream with the exception of my mother's likeness. The succession from the choir in the shurch at the early mass of Easter morning, explaining everything satisfactorily in conformity with sole nutric facts.

This occurred long age and I have never had the feintest reason since to change my views on psychical and spiritual phenomena for which there is absolutely no foundation. The belief in these is the natural outgrowth of intellectual development. Religious dogmas are no longer accepted in their orthodox meaning but every individual clings to some faith in a Supreme power of some kind. We must have ideal to govern our conduct and insure contentment but it is immaterial whether it be one of creed.

art, science or enything else, so long as it fulfills the function of a dematerializing force. It is essential to the peaceful existence of humanity as a whole that one common conception should preveil.

Taska a Astounding Discovery.

While I have failed to obtain any evidence in support

of the contentions of psychologists and epiritualists, I have proved to my complete satisfaction the automation of life, not only through continuous observations of individual actions, but even more conclusively, through certain generalisations. These emount to a discovery which I consider of the greatest accent to human society and on which I shall briefly dwell. I got the first inkling of this astounding truth when I was still a very young man, but for many years I interpreted what I noted simply as coincidences, Kamely, whenever either myself or a person te whom I was attached, or a cause to which I was devoted, was hurt by others in a particular way, which might be best popularly characterized as the most unfair imaginable, I experienced a singular and undefinable pain which, for want of a better term, I have qualified as "cosmic", and shortly thereafter, and inveriably, those who had inflicted it come to grief. After many such ceses I confided this to atters who had the opportunity to convince themselves of the truth of the theory which I have gradually formulated and which may be stated in the following few words.

Our bodies are of similar construction and expected to the same external influences. This results in libeness of response and concordance of the general sotivities on which all our social and other rules and laws are based. We are automata entirely controlled by the forces of the medium, being tossed about like corks on the surface of the water, but mistaking the resultant of the impulses from the outside for free will. The movements and other actions we perform are always life-preservative

and though seemingly quite independent from one another, we are connected by invisible links. So long as the organism is in perfect order it responds accurately to the egents that prompt it, but the moment that there is some derangement in sny individual, his self-preservative power is impaired. Everybody understands, of course, that if one becomes deaf. has his eyesight weakened, or his limbs injured, the chances for his continued existence are lessened. But this is also true, and perhaps moreso, of certain defects in the brain which deprive the autometen, more or less, of that vital qualt ty and cause it to rush into destruction. A very sensitive and observant being, with his highly developed mechanism all intect, and acting with precision in obedience to the changing conditions of the environment, is endowed with a transcending mechanical sense, enabling him to evade perils too subtle to be directly perceived. When he comes in contact with others whose controlling organs are radically faulty, that sense asserts itself and he feels the 'cosmic' pain. The truth of this hee been borne out in hundreds of instances and I am inviting other students of nature to devote attention to this subject, believing that through combined and systematic effort results of incelerlable value to the world will be attained.

Dr. Tosla's First Teleutometon.
The idea of constructing an automaton, to bear out
my theory, presented itself to me early but I did not begin active
work until 1895, when I started my wireless investigations. During
the succeeding two or three years a number of automatic mechanisms.

to be from a Asstructed and antibited to the state of the visitors in my laboratory. In 1896, however, I designed a complete machine capable of a multitude of operations, but the consumeties of my labors was delayed until late in 1897. This machine was illustrated and described in my article in the Century Magazine of June. 1900, and other periodicals of that time and, when first shown in the beginning of 1898, it created a sensation such as no other invention of mine has ever produced. In November, 1898, a basic patent on the novel art was greated to me, but only after the Exeminer-in-Chief had come to New York and witnessed the per-"ormande for what I chaimed seamed unbelievable. I remember that when Leter I called on an official in Weshington, with a view of offering the invention to the Government, he burst out in laughter upon my telling him what I had accomplished. Bobody thought then that there was the feintest prospect of perfecting such a device. It is unfortunate that in this patent, following the advice of my sttorneys. I indicated the control as being effected through the medium of a single circuit and a well-known form of detector, for the reseon that I had not yet secured protection on my methods and apparatus for individualisation. As a matter of fact, my boate were controlled through the joint action of several circuits and interference of every kind was excluded. Most generally I employed receiving eircuits in the form of loops, including condensars, because the discharges of my high tension transmitter ionised the air in the hell so that even a very small serial would draw electricity from the surrounding stmosphere for hours. Just to give an idea, I found, for instance, that a bulb 12" in diameter, highly

exhausted, and with one single terminal to which a short wime was attached, would deliver well on to one thousand successive flashes before all charge of the air in the laboratory was neutralized. The loop form of receiver was not sensitive to such a disturbance and it is curious to note that it is becoming popular at this late date. In reality it cellects much less energy than the serials or a long grounded wire, but it so happens that it does away with a number of defects inherent to the present whreless devices. In demonstrating my invention before audiences, and the sutomaton would answer them by signs. This was considered magic at that time but was extremely simple, for it was myself who

At the same period enother larger teleutomatic boat was constructed. a photograph of which is shown in this number of the Electrical Experimenter. It was controlled by loops having several turns placed in the hull, which was made entirely water-tight and capable of submargance. The apparatus was similar to that used in the first with the exception of certain special features I introduced as, for example, incandescent lamps which afforded a visible evidence of the proper functioning of the machine and served for other purposes.

TELFUTORY TICS of the FUTURE.

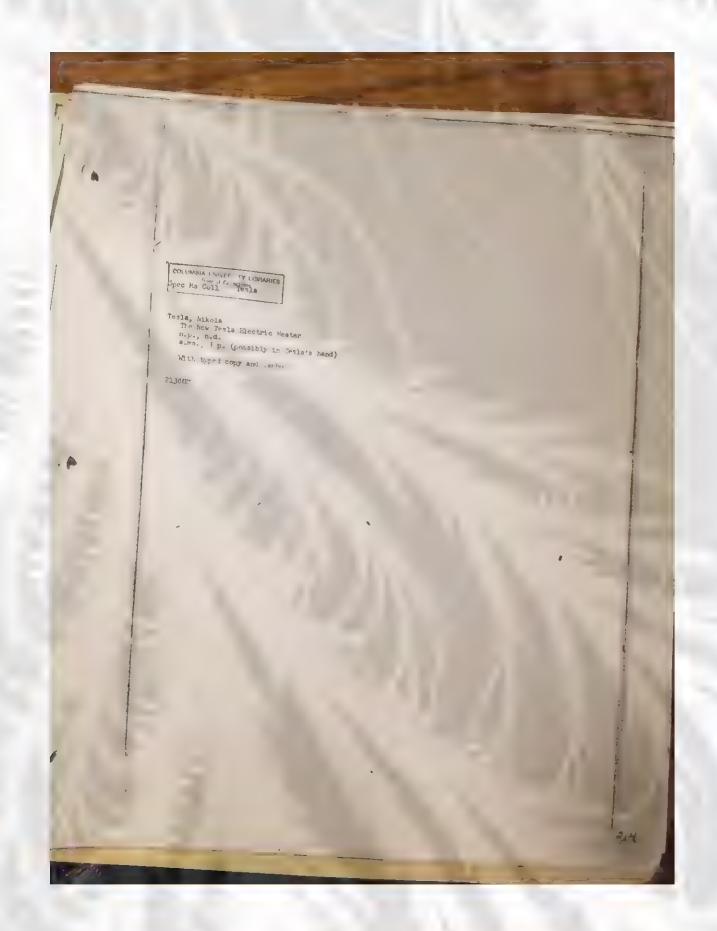
These entomata, controlled within the range of vision of the operator, were, however, the first and rather orace eteps in the evolution of the Art of Telautomatice as I had conceived it. The next logical improvement was its application to automatic mechanisms beyond the limits of vision and at great distance from the

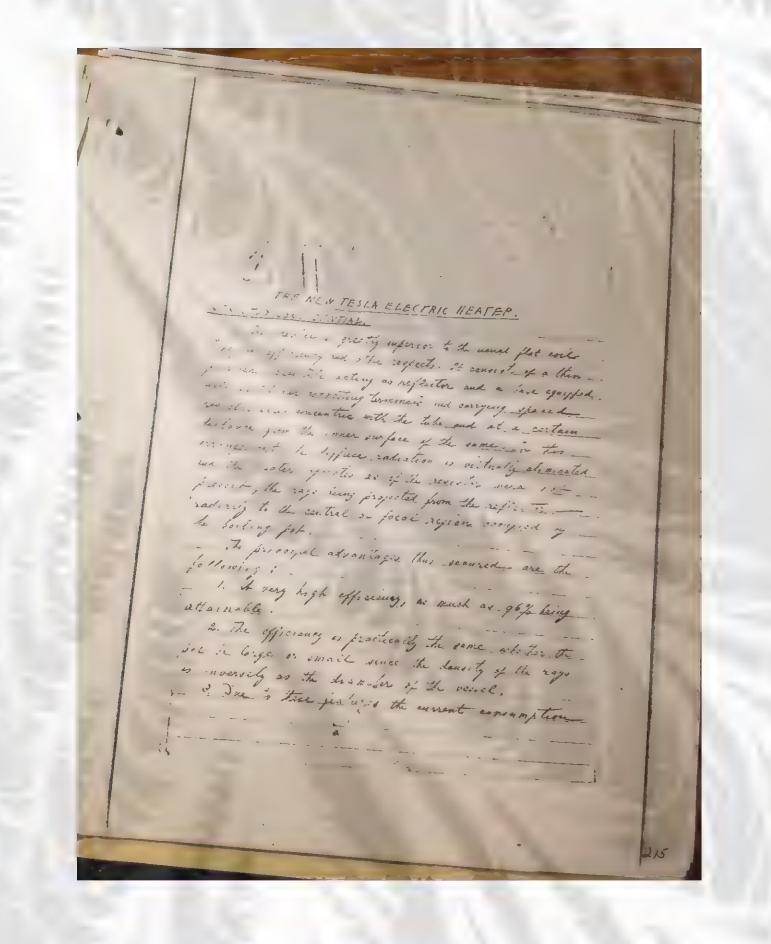
senter of control, and I have ever since advocated their employment as instruments of warfare in preference to gune. The importance of this now seems to be recognized, if I am to judge from essent announcements through the press of achievements which are said to be extraordinary but contain no merit of novelty whatever. In en imperfect menner it is practicable, with the existing wireless plants, to launch an aeroplane, have it follow a certain approximate course, and perform some operation at a distance of many hundreds of miles. A machine of this kind can also be mechanically controlled in several ways and I have no doubt that it may prove of some meafulness in war. But there are, to my best knowledge, no instrumentalities in existence today with which such an object could be accomplished in a precise manner. I have devoted years of study to this matter and have evolved means, making such and greater wonders easily realizable. As stated on a previous cocasion, when I was a student at college I conceived a flying machine quite unlike the present ones. The underlying principle was sound but could not be carried into practice for want of a primemover of sufficiently great activity. In recent years I have suscoesfully solved this problem and am now planning sorial machines devoid of sustaining planes, silerons, propellers and other external attachments, which will be capable of immense speeds and are very likely to furnish powerful arguments for peace in the near future. Such a machine, sustained and propelled entirely by reaction, is shown on one of the pages and is supposed to be controlled either

mechanically or by wireless energy. By installing proper plents
it will be practicable to project a missile of this kind into the
sir and drop it almost on the very spot designated which may be
thousands of miles away. But we are not going to stop at this.
Telautomats will be ultimately produced, capable of acting as
if possessed of their own intelligence and their advent will
create a revolution. As early as 1898 I proposed to representatives of a large manufacturing concern the construction and public exhibition of an automobile carriage which, left to itself,
would perform a great variety of operations involving something
akin to judgment. But my proposal was deemed chimerical at that
time and nothing came from it.

At present many of the ablest minds are trying to devise expedients for preventing a repetition of the awfel conflict which is only theoretically ended and the duration and main issues of which I have predicted in an article printed in the Sun of December 20, 1914. The proposed League is not a remedy but, on the contrary, in the opinion of a number of competent men, may bring about results just the opposite. It is particularly regrettable that a punitive policy was adopted in framing the terms of peace and a few years hence it will be possible for nations to fight without armies, ships or gune, by weapons far more terrible, to the destructive action and range of which there is virtually no limit. Any city at a distance, whatsoever, from the enemy can be destroyed by him and no power on earth can stop him from doing so. If we want to avert an

impending calemity and a state of things which may transform this globe into an inferne, we should push the development of flying mschines and wireless transmission of energy without an instant's delay and with all the power and resources of the metion. -25-





is early more there he's of that in the best heaters of. the type referred to . - . . " The resertor has a relatively much longer life. and can is made to last obmed under noting in some exect. will have were can be used if desired. 5. The heat leving largely confined in the senger, the hillen remacus comparatively rool ---& Souther practices advarlage us preater so fety por a verety of accidents prequently occurring with sdinary ranges 7 The new heater is expecially adapted jo: use on ship board, Pulinan cary acreal vericini and automobiles .____ 8. interese, el es suitable jos all tanda of service on the table, being free from the elections of the -present heaters. ... 9. It sover someterable time in certain applications ___ 19 Jung to simplicity the cost of many acture is low.

Wind field will with two wires winding loth at the same time. One set of field windings to be connected in series, see series A. and the Alimi als brought out. The other act of field sondays should be connected in aries with the armiture, see circuit B. Ecch would to take 1/20 ampere on bo volts .!

THE NEW TYSIA PLECTRIC PEATER

STRICTLY CONFIDENTIAL

This device is greatly superior to the usual flat core type in efficiency and other respects. It consists of a thin polished metal tube acting as reflector and a base equipped with switch and connecting terminals and carrying spaced distance from the inner surface of the same. In this arrangement the diffuse radiation is virtually eliminated, and the heater operates as if the resistor were not present, the rays being tregion receipted by the boiling pot.

The principal advantages thus secured are the following:

- . A very high efficiency, as much as 96% being attainable.
- is large or all since the density of the rays is inversely as
- Tore than hal of that in the best heaters of the type referred
- 4. The resistor has a relatively much longer life and ban be made to a talmost indefinitely in some cases. Also less wire can be ed if desired.
- 5. The heat being largely confined to the range, the kitchen remains comparatively cool.
- 6. Another practical advantage is greater safety from a variety of accidents frequently occurring with ordinary
- 7. The new heater is especially adapted for use on shipboard, Pullman cars, aerial vehicles and automobiles.
- 8 Likewise, it is suitable for all kinds of service on the table, being free from the objections of the present
 - 9. It saves considerable time in certain applications.
 - 10. Owing to simplicity, the cost of manufactoring as low.

THE HEW TESTA PETOTRIC HEAVEN.

STREET, CONTINUENTA.

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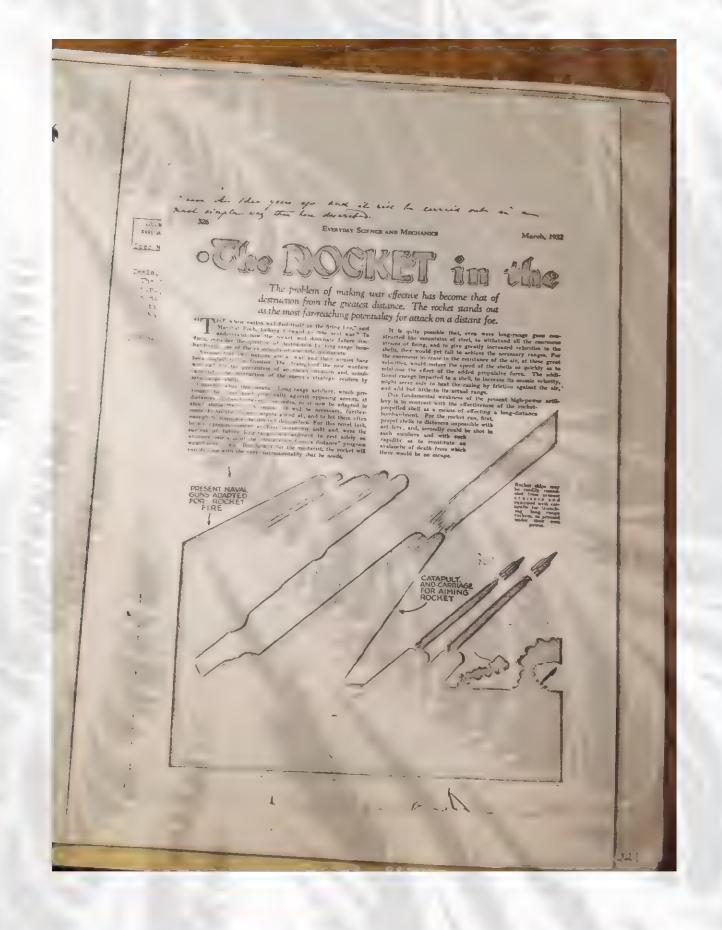
and other recents. It emptots of a thin polished ratal tube acting an reflector radiator wires commented with switch and commenting terminals, and carrying speed resistor wires commented with the tube and at a cortain distance from the inner inated, and try butter operates as if the resistor ware not present, the rays point from the reflector radially to the central or fecal region eccupied by the beiling pot.

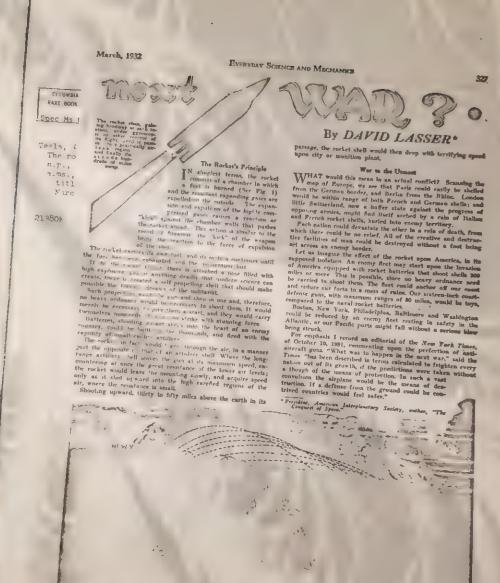
The principal advantages thus secured are the following:

- A very high efficienty, as much as 90% being attainable.
- or maxis, since the density of the rays is inversely as the dimeter of the
- 5. Due to these features the current consumption is hardly more than half of that in the best heature of the type referred to.
- 4. The recistor has a relatively much longer life and can be made to last almost indefinitely in some cases. Also less wire can be used if desired.
- 5. The heat being largely confined to the range, the kitchen remains
- 6. Azother practical advantage is greater safety from a variety of accordance frequently occurring with ordinary ranges.
- 7. The new heater is especially edapted for use on shipboard, Pallman care, sorial vehicles and automobiles.
- 8. Libraice it is suitable for all kinds of service on the table, being free from the objections of the present type.
 - 9. It saves empiderable time is cortain applications.
 - 10. Owing to simplicity, the cost of manufacturing is low.

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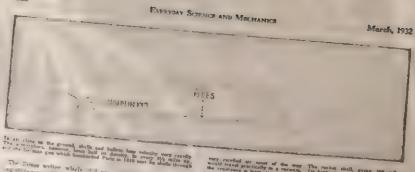
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Against an invading figst armed with looperance rockets, the heaviest of court defense and nevel gons might be as car as as disease. The extension of hertle steed would be as revolutionary at the degree

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The Kockes Piene

The fell effectiveness, afe raids onest come as surprises and could swiftly. The attacks on London and Paris, during the World War, assaily failed to surprise. Sound deraders, and the darkening of early and the darkening of either, the nee of searchlights, and the darkening of cities, the nee of searchlights, activities.

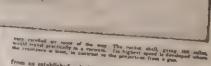
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lectors and the darkening of cities, the use of searchights and the darkening of cities, the use of searchights and the darkening of cities, the use of searchights and the darkening planes helped to hinder their activities.

The control of the activities and the darkening planes helped to hinder their cities of the activities. The control of the con

A LTHOUGH this discussion of the use of the rocket may seem functial, it is based only upon what can be developed



from an established principle. Experimental rockets have been projected, in the last rear, to distances of three to five miles and heights of six miles. Toy models, they developed considerate power and have encouraged experimenters throughout the world to continue in tame the giant that alumbers in the market.

projected, in the last year, to distances or unreasonable power and herefolds of six units. Toy models, they developed considered and power and have encouraged experiments: throughout the world to constitute the analysis of the level construction, and the control of its dight through the rockets, because the gas and the control of its dight through the rockets possibilities, that he donated \$100,000 to support cist. Working to Pr Robert H. Goodard in perfecting an instance of the sevent of our upper atmosphere cist. Working to the some of the sevents of our upper atmosphere cist. Working to the best control to the sevents of our upper atmosphere cist. Working the debt did to aviation.

Only recently did he obtain the patenting of a rocket already has belief that the rocket plane can fy at upward of 1000 milest a hour in rarefied air. In Germany, Italy, France and Russian rocket experiments are captoring the rocket's peace time potentialities, with a view to building rocket experiments are as ploving the rocket's peace time potentialities, with a view to building rocket experiments are as ploving the rocket's peace time potentialities, with a view to building rocket experiments are as ploving the rocket's peace time potentialities, with a view to building rocket experiments are as a security of the rocket peace time potentialities, with a view to building rocket experiments are as a security of the security of the control of the control of the rocket and the profession of the need of future warfare. He warned his audience that the full state of the security of the security of the peace of security of the control of the peace of the security of the peace of the pe

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Seventh Chapter
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Seventh Chapter.

What my uncle Herse said and what my times Herse was; and why Fritz Sahlmann had to whistle.

When the watchmaker was taken down the castle hill, Frits Sablmenn had, of course, gone along, only in order to see how the thing became the prisoner and if he would not perhaps escape, but the latter did not come to pass. The procession moved slowly down to the town-hall, for it had to wind its way troublesomely through all sorts of teams and wagons, which had been commanded from the villages and the town for the transportation of baggage and booty and were now drifting together in the castle-court and on the road to the castle and surrounded by Frenchmen, that they might not again escape, for the old farmers were already devilish smart to this The watchmaker went along with his two guardians, pau ent as a lamb and also perfectly calm, for though he had been greatly frightened at first and although the whole affair of last night was very disagreeable and serious for him, during the examination which the adjutant had instituted with him he had come into a frame of mind, which might be described as: "Yes, you talk on! You may say a great deal before a word of it will please me?, and his answers had turned out very chary. And although he had not in him that wild courage which immediately goes for everything, he had already been too long in the world and been in a scrape so often, that he did not immediately despair. He let things come as -73m

12

they may. "I wonder how this is going to the said to nimself, then he was pushed into the door of the town-hall. .

"Fritz Sahlmann", said and there to the boy, when he wunted to go up to the castle again, "what does this mean?" Fritz Sahlmann tells with the greatest importance the story of yesterday, and that Mr. Droi has slept in Manselle Westphalian's room and had broken up everything and how he himself had dropped and broken the chief-magistrate's pipe, -but he could not help it, it was Fiken's fault- and that the colonel had wanted to stab the chief magistrate and how Manselle Westphalian was sitting in the kitchen, a picture of despair; but about the lump of ice he said nothing.

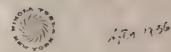
Now my uncle, and that had its reason. For as he whispered to me long years afterward, when Benaparte was already dead, he used to belong at this time to the League of Virtue. And I do believe him, because when he was in company he would always play with a long watch chain of very light hair - and aunt Herse's was black - and he would always show a dangerously big iron wing finger ring, with which he had one time almost beaten that vagadoni Huepner, a journeyman locksmith, to death, when he had behaved in a very impolite manner in the court room. - "Frits", he said to me later, "this hair is from a heroic maiden, who anno thirteen had

4. 20 DOLD

her head shorn for the fatherland, and this iron ring has cost me my gold one. But do not speak of i', I do not like it." Therefore he was at the time when this story happened, with good reason much for secrecy. It is possible, too, that his way and manner of lookin over everything together from a distant point of view had much to do w in his leaning towards secrecy, for while my father had to has himself day and night with the most trifling drudgery and (*1.). order that the little old needy community might barely remai. Parate together and would not go to pieces altogether entirely, and distinguisherse would let Rutosow march to the right and Tzernitchen to the left, praise York and scold about Buelow, he did not understand his business, for he should not have moved to Berlin, but to the right as far as Stemhagen and rushed into Benaparte's flank. In short, he was just the right sort of a man to turn a sneeze into a thunderclap: in every innocent French corporal he saw a Corsican tyrant, and if on some blue Monday at a workmen's row constable Luth had received a few blows too, then he would carry on, as if the Duke of Mecklenburg had been treated to a slap in the face.

"Hold your tongue, boy!" Herse whispered very seriously, "do you want to cry out your death sentence here in the public market place? - For the watchmaker's life I would not give a single groschen, because it is certain that the miller and his Frederick have killed the chasseur ... " - "Not the miller", Fritz'

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n.p., after 1936
t.ms., 10 pp.
(Some biographical information, but
mainly on his various discoveries) 213808



At the close of 1833, having worked one year in the shops of George Postinghouse, Pittsburgh, I experienced segment a longing for resuming my interrupted investigations that, notwithstending a very tempting proposition by him, I left for New York to take up my laboratory work. But owing to pressing demands by several foreign scientific societies I made a trip to Europe where I located before the Institution of Electrical Engineers and Royal Institution in London and the Societa de Hysique in Paris. After this and a brief wisit to my home in Yugoslavia I returned to this country in 1832 eagur to devote myself to the subject of prodilection of my thoughts: the study of the universe.

During the succooding two years of intense concentration.

I was fortunate enough to make two for-reaching discoveries.

The first was a dynamic theory of gravity, which I have worked out in all details and hope to give to the world very seem.

It explains the causes of this force and the motions of heavenly bodies under its influence so satisfactorily that it will put an end to idle speculations and false conseptions, as that of curved space. According to the relativists, space has a tendency to curvature owing to an inherent property or presence of colestial bodies. Granting a samblence of reality to this fantastic idea, it is still self-contradictory. Every action is accompanied by an equivalent reaction and the effects of the latter are directly apposite to those of the former.

- 2 -

Supposing that the bodies act upon the surrounding space causing curvatures of the same, it appears to my simple mind that the curved spaces must react on the bodies and, producing the opposite effects, straighten out the curves. Since action and reaction are co-cristent, it follows that the supposed curvature of space is entirely impossible. But even if it existed it would not explain the motions of the bodies as observed. Only the existence of a field of force can account for them and its assumption disponses with space curvature.

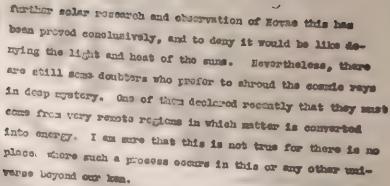
All literature on this subject is futile and destined to oblivion. So are also all attempts to explain the workings of the universe without recognizing the existence of the other and the indispensable function it plays in the phenomena.

est importance. As I have sourched the scientific records in more than a half dozen languages for a long time without finding the least anticipation, I consider myself the original discoverer of this truth, which can be expressed by the statements There is no energy in matter other than that received from the environment. On my 75th tirthday I made a brief reference to it, but its missing and significance have become clearer to me since them. It applies rigorously to molecules and atoms as well as to the largest heavenly bodies, and to all matter in the universe in any phase of its culatures from



- 3 -

Being perfectly entisfied that all energy in matter is drawn from the environment, it was quite natural that when radioactivity was discovered in 1898 I immediately started a search for the external agent which caused it. The existence of radioactivity was positive proof of the existence of external rays. I had previously investigated various terrestrial disturbances affecting wireless circuits but none of them or any others emanating from the earth could produce a steady sustained action and I was driven to the conclusion that the activating rays were of comic origin. This fact I announced in my papers on Roentgon rays and Radiations contributed to the Electrical Review of Mew York, in 1897. However, as radioactivity was observed equally well in other widely separated parts of the world, it was obvious that the rays must be inpinging on the earth from all directions. How, of all bodies in the Cosmos, our sun was most likely to furnish a clue as to their origin and character. Before the electron theory was advanced, I had established that radioactive rays comsisted of particles of primary matter not further decomposable, and the first question to answer was whether the sun in charged to a sufficiently high potential to project such particles and produce the effects noted. This called for a prolonged investigation which colminated in my finding that the sun's potential was file billions of volts and that all such large and hot heavenly bedies endt courte rays. Errord



A few words will be sufficient in support of this contention. The kirotic and potential energy of a body is the
result of motion and determined by the product of its mass
and the square of velocity. Let the mass be reduced, the
chargy is diminished in the same proportion. If it be reduced
to save the energy is likewise zero for any finite velocity.
In other words, it is absolutely impossible to convert mass
into energy. It would be different if there were forces in
mature empable of importing to a mass infinite velocity.
Then the product of zero mass with the square of infinite
volocity would represent infinite energy. But we know that
there are no such forces and the idea that mass is convert-

while the cuicks and character of the says observed mark the curches complete are sufficiently well ascertained, the co-called scende ways observed at great altitudes presented



- 8 -

a riddle for more than 25 years, chiefly because it was found that they increased with altitude at a rapid rate. ly investigations have brought out the astoniching fact that the officers at high altitudes are of an entirely different rature, having no relation whatever to commis rays. These are particles of matter projected from colontial bodies at very high temperature and charged to enormous electric potentials. The effects at great elevations, on the other hand, are one to waves of extremely small lengths produced by the sun in a esrtain region of the atmosphere. This is the discovery which I wish to make known. The process involved in the goneration of the waves is the followings The sum projects charged particles constituting en electric current which passes through a commetting stratum of the atmosphere approximately 10 kilometers thick envoloping the earth. That is a transmission of energy exactly as I illustrated in my experimental lantures in which one end of a vive is connected to es electric generator of high potential, its other and being free. In this case the gontrator is represented by the our and the wire by the confincting air. The passage of the soler current involves the transference of electric charges from particle to particle with the speed of light, this resulting in the production of extremely short and



- 4 -

ponetrating wayos. As the air stratum mentioned is the source of the waves it follows that the so-called commie rays observed at great altitudes must increase as this stratum is approached. By researches and calculations have brought to light the following facts in this connections (1) the intensity of the so-called counte rays must be greatest in the zenithal portion of the atmospheres (2) the intensity should increase more and more rapidly up to an elevation of about 20 kilometers where the commuting air stratum bogins; (3) from there on the intensity should fall, first slowly and then more rapidly, to an insignific eant value at an altitude of about 30 kilometers; (4) the display of high potential must occur on the free and of the terrestrial wire, that is to say, on the side turned away from the mm. The surrent from the latter is supplied at a preasure of about 216 billion volts and there is a difference of 2 billion volts between the illuminated and the dark side of the globe. The energy of this current is so great that it readly secounts for the surure and . other phenomena observed in the atmosphere and at the carth's surface.

For the time being I must content sysulf with the dummandment of the salient frots, but in the course I course to be able to give here or less accurate testimical



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data relating to all particulars of this discovery.

To go to another subject, I have devoted much of my time faring the year past to the perfecting of a new small and compact apparatus by which energy in considerable amounts can now be flashed through interstellar space to any distance without the slightest dispersion. I had in mind to confer with my friend George H. Hele, the great astronomer and solar export, regarding the possible use of this invention in connection with his our researches. In the meantime, however, I am expecting to put before the Institute of France an accurate description of the devices with data and exhaulations and claim the Pierre Girman Prize of 100,000 frames for meens of ecommication with other worlds, feeling perfectly sure that it will be suarded to me. The money, of course, is a trifling consideration, but for the great historical honor of being the first to achieve this miracle I would be elmost willing to give my life,

By most important important from a practical point of view is a new form of tube with apparetus for its operation. In 1826 I knowled out a high potential tempethese tube which I operated successfully with potentials up to 4 million volta from 193 to 193. This design too cloped by many initiations



...

and with elight modifications it is employed even now in all rescarch laboratories and saiontific institutions here and in other countries, and virtually all atomic invostigations are carried on with it. At a later period I mraged to produce very much higher potentials up to 18 million volts, and them I custometered unsurrountable difficulties which convinced me tint it was necessary to invent an entirely different form of tube in order to carry out successfully cortain ideas I had conceived. This task I found for more difficult than I had expected, not so much in the construction as in the operation of the tube. For many years I was baffled in my efforts, although I mide a steady slow progress. Firmlly though, I was remarded with complete success and I produced a tube which it will be hard to improve further. It is of ideal edeplicity, not subject to wear and can be operated at any potential, henover high, that our he produced. It will entry heavy surrents, transform any ensure of energy within practical limits, and it posmits easy control and regulation of the same. I expant that this immunion, whom it become known, will be universally adopted in preference to other form of telus, and that it will be the mans of obtrining results universel of before. Among others, it will emable the production of cheny rations out stitutes in any desired consisty and will to, in the call, immedy more and other in the to ming of

and the best of with a manufacture



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will be possible by its use to earry out a process in which there should be no minsos whatever, but only hits. However, this tube will not open up a say to utilize atomic or nubstrate energy for power purposes. According to the physical truth I have discovered there is no available energy in atomic structures, and even if there were any, the input will always greatly exceed the output, proclading profitable, practical

Some papers have reported that I had promised to give a full description of my tube and its accompanies on the present constaint. This has council no considerable analyzable, ording to some obligations I have unfortaken regarding the application of the table for injuriant proposes, I am another to take a complete disclosure now. But as soon as I am relieved of those obligations a technical description of the device and of all the apparatus will be given to scientific institutions.

There is one more discovery which I want to announce at this time, consisting of a new method and apparatus for the obtainment of vacua cancelling many time the highest haretened. I think that as much as encohillienth of a mission one to attained. Find may be accomplished by mana of much thorax is a mather of employment, but it is challed that the profile of employment, but it is challed that the profile the part of the pa

- 10 -

effects in electron tubes. By ideas regarding the electron are at variance with those generally entertained. I held that it is a relatively large body carrying a surface charge and not an electrontary unit. When such an electron leaves an electrode of entremely high potential and in very high vacuality carries an electrostatic charge many times greater than the normal. This may astoniah some of those who think that the particle has the same charge in the tube and outside of it in the air. A beautiful and instructive experiment has been contrived by me showing that such is not the case, for as soon as the particle gets out into the atmosphere it becomes a blacing star owing to the escape of the ouccas charge. The great quantity of electricity stored on the particle is responsible for the difficulties encountered in the operation of certain tubes and the rapid deterioration of the same.

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Tesla relating to force and matter, to
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theory of gravitation) 3748CE

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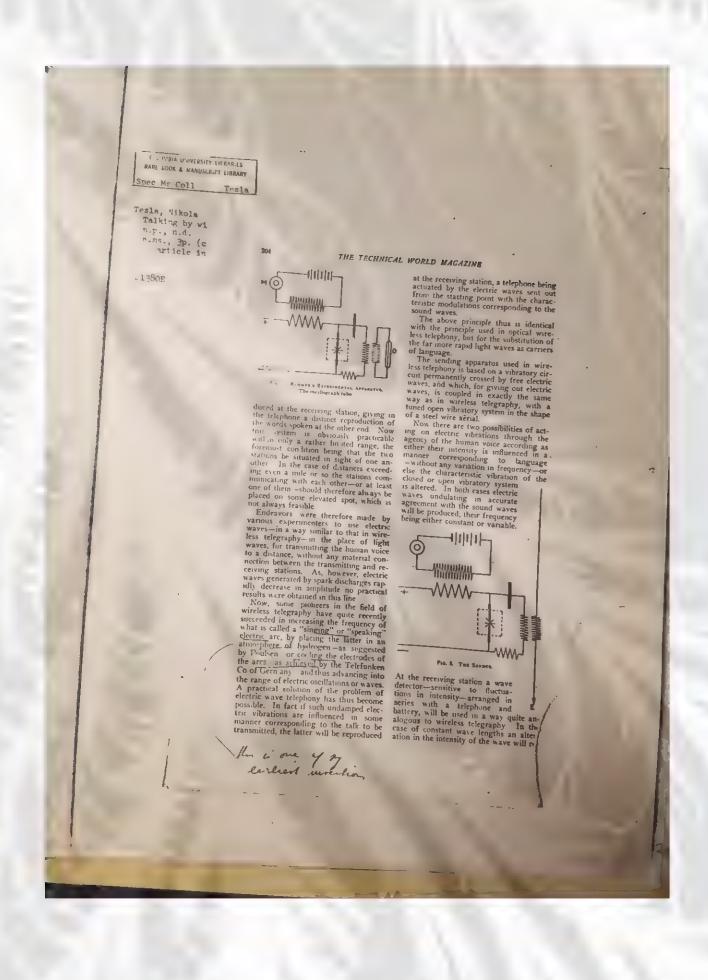
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Tapp., n.d.

s.ms , 3p. (comments written by Tesla on 3 pages of

writtele in The Michigal World Magnzine, p. 203-206, n.d.) 2138/18





J'RA LOUGHSITY HER'R 15 RARE ENOR & N'ANUSCR : I LIBRARY "pec Ms Coll Tesla, Wikola Talking by wi ons. 3p. 1 vale in a corresponding alteration in the control on the receiver, while with variable matter receiver, while with variable wave lengths a variable number of acrowing waves to control of the with the street of which thus the receiver the vale of a receiver the vale of a receiver of the without of a receiver of the window of the street of the vale of a receiver of the vale of a receiver of the re TALKING BY WIRELESS . 1 -47: Ruhmer is inclined to suppose the existence of a composite effect, depending on an alteration both in the wave length and intensity of the electric oscillations. Whenever a flaming are was fed with indulating high frequency currents, this would render clearly and distinctly any word spoken in the transmitter, in fact with an intensity exceeding that of the familiar direct-current "speaking" are.

After these successful preliminary trials, there was not much left to be done before the human voice could be transmitted by the same TUNING COIL (O) T 5 secondary terminals of the Tesla transformer

On examining this electric are it was found to show the appearance of a continuous current are, its frequency—about 306000 per second—being far too high to decompose it into individual spark discharges. This observation induced Mr. Rulbrae to alter the generation of waves in the same way as the "speaking" are lanp. The choking coil so far inverted in the feeding circuit of the afe and which was mitended to prevent any reaction of the rapid oscillations on the direct current circuit, was replaced by an induction coil the secondary winding of which was connected to a transmitter and lattery (fig. 1). This experiment proves successful, as on talking into the transmitter the oscillograph tube—an instrument for measuring the shape of the wave—distinctly showed a glowing band of variable luminous intensity with notches cor responding to the sound waves, showing the intensity of the high frequency currents in the secondary coil of the Tesla transformer to be influenced in a manner or responding to the spoken words. While being unable to decide which of c two processes above referred to has en realized in the present case, Mr. process with the aid of electric waves. The arrangement used to this effect is represented in figures 2 and 3. After first using a transmitter contact as wave detectors Ruhmer eventually replaced thus by an electrolytic cell, which proved more efficient.

Experiments so far made, while being confined to the inventor's laboratory, gave surprisingly favorable results, spoken words being transmitted, with the aid of an aerial one and one-half meters in length, to the available distance of thirty meters.

Mr. Ruhmer is actively engaged in continuing these interesting experiments and confidently hopes by this method to bridge distances of several kolometers, provided aerials of sufficient length be employed. The most advantageous feature of this method seems to be the

CR. L''BIA U TIVERS, TY LIERARIES RARE BOOK & MANUSCRUT LIBRARY Spec Mr Coll Tesla

Tesla, Nikola Talking by n.p., n.d. a.ms., 3p.

THE TECHNICAL WORLD MAGAZINE

7100

fact that a nost accurate tuning can be fact that a next accurate tuning can be obtained such as that required for two statems to communicate with each other within, any risk of interference on the part of a thire parts. The objects of the wireless telephone will perhaps be best seen in its applica-

tion to vessels as a means of lessening the danger of collisions. This is a field already taken by space telegraphy but in-volves the presence of a skilled operator constantly at the side of the officer in charge an objection which will not ap-ply to wireless telephony

Noisiest Whistle in the World

By James Cooke Mills

h a voice from Bedlam like a triple blast of a monster siren, rendering dumb all the little noises, yelps, toc.1s, and whines of simaller mechanical throats, should suddenly pierce a traveler's ears, it is very likely he would quickly cover them and wender what had broken loose. A hundred chances to one, when the roaring blast had reased, he would seek the cause of the uproar to register his denunciation of the giant whistle trust, a noise combine, that has throttled all the smaller whistles in a radius of twenty miles.

sn aller whistles in a radius of twenty miles.

But if he sought a resident of East St. Louis the busy St. Louis suburb across the Mississippi and necessarily a victim of the nerve-racking and discordant blasts proceeding from the manufactories, he would be told that the seemingly terrible, three mouthed nonster is a blessing in disguise to the 100,000 people living within the range of its deep, penetrating blasts.

blasts.

East St Louis probably had more independent whistles than any other city of like size in the country, and exercised them more. Each factory possessed its special whistle, actuated in accordance with its particular clock, and searcely two time-pieces being exactly synchronized, the din produced by the various airens, each of which had a distinctive tone, was a discordant jamboree.

sirens, each of which had a distinctive tone, was a discordant jamboree. Whistles blew at all kinds of time— tramp, local, and standard, also in varia-tions. The iron and steel foundry's

whistle sounded at seven o'clock by its clock time, and the aluminum works' whistle sounded at 7 05 by the foundry's clock, but at seven by its own. Whistles on the glass works, elevators, flour mills, gas works and a hundred others in various lines were let loose before and after the correct time, and for ten minutes or more residents throughout the city were in despair. In some factories there was a rivairy to see whose whistle would get the air first, and in this way many minutes were lost at might, but made up in the morning. All this whistling meant to the ear drums.

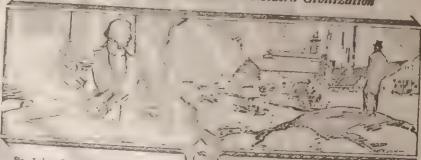
In order to reclaim the city from this whistling babel a practical way was devised by L. C. Haynes, general manager of a suburban electric railroad. The company communicated with various industrial concerns in the city, proposing to establish one powerful steam whistle in a central location, to serve all the manufactories. The plan was adopted, and it was generally agreed that the new siren should have a loud and penetrating tone capable of being heard at least ten miles, but that its voice was not to be objectionably shrill.

After careful designing, an immense siren, the greatest whistle in the world, was made and installed on the power house of the railroad company. This great modern were comprises three whistless. The largest is almost six feet in city main whistle there is a smaller one. T whistle sounded at seven o'clock by its

COLUM A BOW (RSITY LIBRARIES RAPE EPOR & NANGSCRIPT LIBRARY Spec Ma Coll Tesla Nikola
The 10 greatest inventors..., by John S. Seymour
D.P., [Dec. 1923]
a.ms., lp. (comment written by N. Tesla at foot of p. 138
of article in Popular Science Monthly, Dec. 1923, p. 35~37, 137-138) POPULAR SCIENCE MONTHLY

The 10 Greatest Inventors

And What They Have Given to Modern Civilization



By John S. Seymour, Formern of Paranta

A M to select the 10 greatest feventers of my reason and the so my reason and the select the 10 greatest feventers of my reason and the select the select

Pathfunders of Modern Progress

Then began the era of modern progress.

From this era I have selected the 10 inventors whom I consider the greatest, basing my judgment on their work -its utsity, originality, and its permanent value in meeting the needs of mankind.

These 10 greatest, all of whom have beed within the last 150 years, are

Within the last 150 years, are
Fit Whitney
Charles freedy rar
Sammar F B More
Alexandre freed with Medicarms k
Viola Tesla
Cymar Hall Medicarms k
Wilbur Wright

Cyru-Hai McCormek Wilbur Wright
Here we have the creators of the cotton
gin, the vulcanzing rubber process, the
telegraph the telephone, the reaper, the
awing machine, the quantity production
of steel, the meandescent light, the alternating current, and aviation, inventions
great in themselves and each of them
stepping atones to greater benefits to men.

because he led the way in a development from which most great manufacturing enterprises of today draw their life blood—the standardisation of parts. Firearms were the principal mechanical contrivances of Whitney's day. They were made almost entirely by hand, and no two loves almost entirely by thand, and no two loves almost entirely by making duplicate parts interchangeable for repairs, an appalling waste in material and labor would be eliminated in achievement of the part of the quantity production of watches, motor cars, and thousands of mechanical articles in use today. Whitney's invention of the cotton gin as original and basic and useful. The cotton that we use today in myrind forms and dabric, would not be ours in the huge quantities we need and at prices we can afford to pay had not whitney's genius prepared and highed the Way.

Faller of the Rubber Industry.

Father of the Rubber Industry

Father of the Rubber Industry

To Charles Goodyear we owe our multifarious use of rubber—waterproof shoes and clothing, fire hose, comba, insulation for electric wires, rubber tires, and even golf balls. Fror to Goodyear, the treatment of rubber was prunitive, faulty, and unsatisfactory. In hot weather the rubber became too soft. In cold weather it was too bard. Daniel Websier, describing his experience with a rubber cloak and hat, made prior to Goodyear's discoveries, asaid:

"I put the cloak outdoors one cold day, and it stood alone. This interested me and I tried placing the hat on the top of the coat. The effect coat. The effect was strikingly lifelike and pas-



WHITNEY

Eli Whitney's cotton gin dates back to 1793, 50 years before the telegraph of Morse, the seeing machine of Howe, the Jonathan of Tubber by Goodyear and the resper of McCormick Among the 10 immortals of modera invention Whitney was the junneer, not only because he invented the cotton gin, but





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How Morse Concerned Telegraph

Host Morse Concetted Telegraph

At the age of 40, Samuel First, Breeze
Morse was a surematin attast. Returning
from however, at after a timp abroad
to moderna area edge of ast he heard a
to moderna area edge of ast he heard a
term passed through a chain and bright
flashes of night were visible among the
limin. To Morse through untrained in
home to the standard the throught,
limited the courted markathy the throught,
limited to carry messages."
Indicate the shy reached New York,
Morse had evolved the greens whene of
the Morse (ode and) and even named the
forestion he intended to make asome day,
the theograph. As he celt the ship he
and to the captain. If you hear of the
world, remember that the discovery was
made on your ship."

In January, 1838, his first message was
clicked off over three miles of wire
airetched about the room in which he

POPLLAR SCIENCE MONTHLY

whered with he was ate Arford Val. On Van L.1541 when the Rationare and wantington line had non-completed. More rathe of the securation of Clay for Promote to the national capital, where the name was received with assumment.

where the saws was received and saw Moree swift on the age of Al, and saw the results one said by some. We make his mines seem place among be great. Away der fanken Reij at the real father of the tray we while Ren. Fed. 1 (any Irechean Remmer Highes, Laste and others are supporting real.



cributors. Others had the interrupted current. Bell had the continuous undulating current. It is incorrect to say that the temphone transmits speech. It transmits only a small, ident continuous variable meeting arrent and thereby at the receiving end





speech a reproduced by the inhibitions of a disphrogin. In his apparent on for his further and the speech of the first and the speech of the s

McCormick's Reaper Was Snored At.

Through the reaper of Cyrus Hall McCornucs the word great its hread. Yet when this machine was first exhibited at the Words a Fair in London, the public smiled distribution was first exhibited at the Words a Fair in London, the public smiled distribution to the London France scale which is the comment of the comment of the comments of the London France and a fixing machine "a recommend to develop a reaping machine and the non-benefit of the comments of the c







POPULAR SCIENCE MONTHLY

Power and Light from the Limitless Winds

Instructor, Department of Physics, Columbia University

Columbia University

N THE light of present-day developments to methods of capturing and utilizing natural sources of power, most persons probably look upon the windmill, devised by man some time prior to the twist obsoleta, sevent in isolated sections, yet in the opening of leading observations, the far from being the case.

I mpromes a tours, at they case of million of the form of the prior are valuable and in its to make they case of the case.

I mpromes a tours, at they cossess in the case, they are a unior for the prior of the case of the case. In they cosses a tours of the case of

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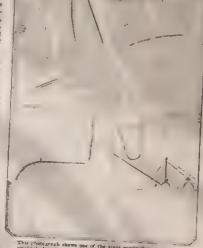
May Drive Locomolines

May Drive Locomotives

A striking examine or the possibilities of the modern windrail as Joind to East Prussia, Germany There 11 windrails of the type pictured on tha page have been constructed recently to supply electric power during the examination coal shortage. So efficiently have the wind motors operated in supplying current for electric power during the examination of the wind and to any power of the first power are being taken to use wind granerated power to drive locomotives of a local railroad that was forced to suspend because of the nationwide coal shortage. The power generated by revolution of the windrail wings turn a dynamic, and the energy produced as held in storage batteries. This method of transforming the power of the wind into electric current has been employed before in this and other countries, but the wind motors constructed in Germany are unique in many important particulars.

For one thing, the new windmill, unlike all other types, requires no indicator, for one thing, the new windmill, unlike all other types, requires no indicator, for one thing such as for the produced by having the blades for motor directions of the wind the rapid wheel that rests on ball bearings such as offers as produced by having the blades for motor directions of the wind the rapid wheel that rests on ball bearings such as offers as produced by having the blades for motor directions of the wind the rapid wheel that rests on ball bearings and automatically keeps its axis at right angles to the direction of the wind wheel to utilize the wind wheel to utilize the

entire force of the wind for power produc-tion. In the picture at the top of this page the wind at blowing from the direc-tion of the observer. Under the same conditions in any other type of windmill



This photograph shows one of the grant windmit power station untablished in East Prussa to generate electricity for light see power during coal shortage. They may be used to run railway train

the wind wheel would be on the observer's side of the tower.

The design of the wings is sample yet organd. Every known scientific fact regarding windmills and wind motors was taken into consideration in

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their construction in order to produce maximum power from minumum air movement. The wings were designed by a acted manufacturer of surplane propellors, and were tested in the secodynamic laboratories at Gottingen, Germany, before installation.

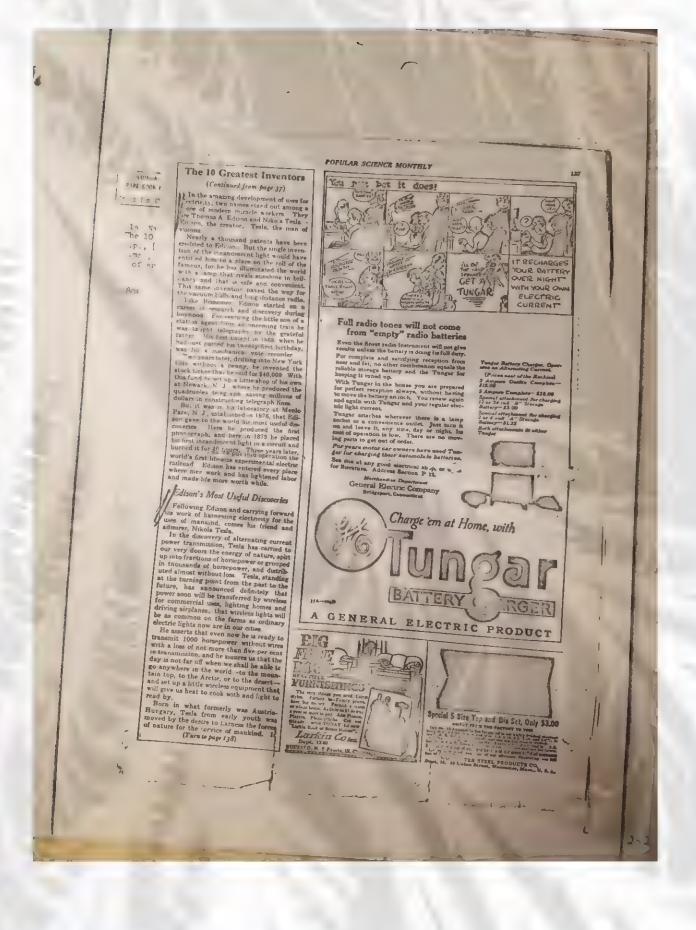
Moved by Light Breeze

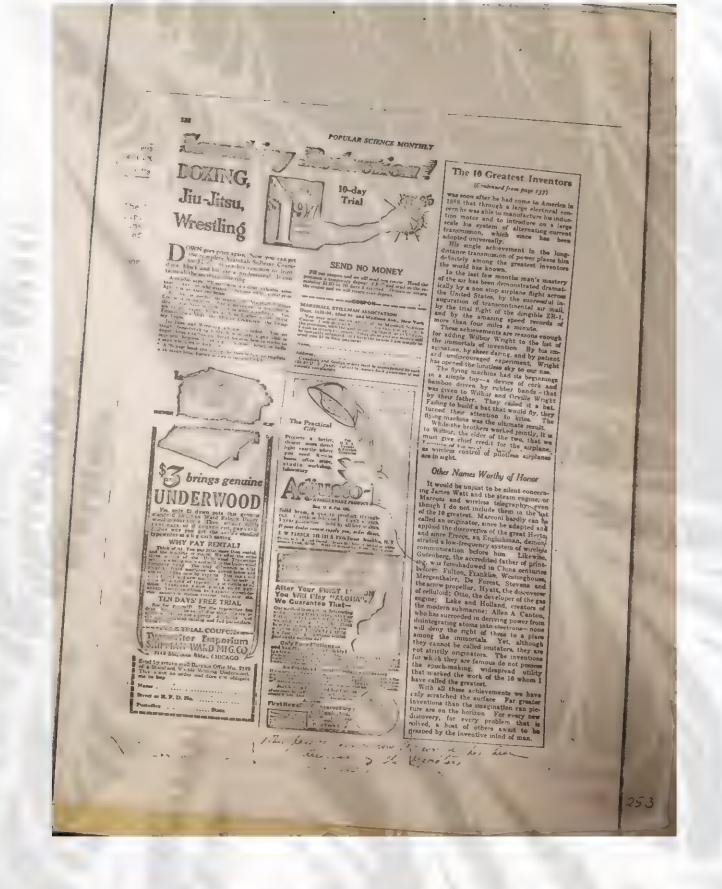
A breeze barely sufficient to stir the leaves of the trees will set the great wings in motion, although the circle they describe in slimant 60 feet in diameter. Once started, they will continue to recolve as long as there is the faintest movement in the air A normal wind will produce about 60 horsepower and astrong wind 70. On days when every other windmill near by is still, those of the new design are supplying power and astrong wind 70. On days when every other windmill near by is still, those of the new design are supplying powers and astrong wind for the still produce about 60 horsepower and stream from turning two feet as the arms from turning two rapidly in a gal at the times trees from centrifugal force as the sign of each arm is a disk that roses from centrifugal force as the production of the wind, the speed of the wind wheel is always kept within reasonable bounds. The towers upon which the arms are mounted are about 50 feet high. They are cylledineal in ahaps, built of iron and cement.

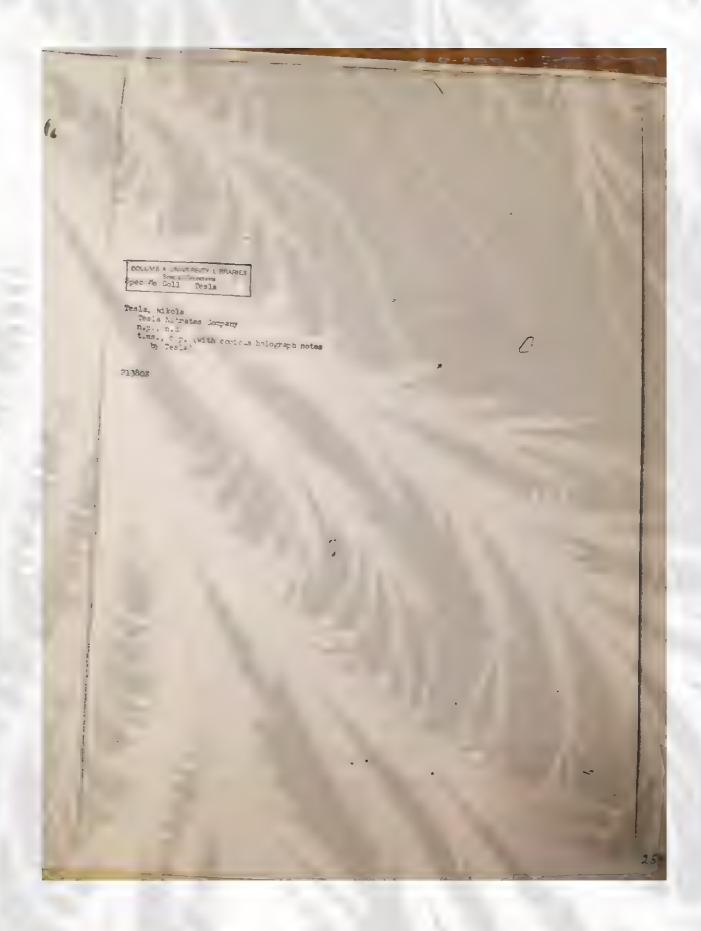
The construction cost of the wind motors as and to be relatively low, considering the amount of power they produce. America and European and European engineers are watching the amount of power they produce. America and European engineers are watching the amount of power they produce. America and European engineers are watching the amount of power they produce. They see in it a valuable acceptant to the wind that the efficiency and economy.

"Wind Power a Substitute for Coal"

JAMES LORING ARNOLD, professor of electrical engineering at New York University, commenting on the glacering at New York University, commenting on the University of the Professor of electricity and engineering point of shew. The professor of electricity on an engineering point of shew in the energy produced cone the bank of easily the rapidity which the cut for the professor of which but the energy produced cone the bank of easily the rapidity with which the cut for the professor of the profess







PROSPECTUS FOR MR. TESIA !! HITRATES COMPANY.

have formed the basis of so many second practical applications of electricity, and second practical applications of the many second practical applications of the many second participations of the

tremendous walue and wide-reaching influence, bids fair to outrank
many times his wonderful invention of the alternating current motor.

the atmosphere give in a mach more offective degree a possibler of combinations: a strang which brings about this most difficult of combinations: a strang which all workers in this from more framework for years as baing one which not only must be of tramendous power, but of almost infinite suddenness. The time of the content which has a statically interferred with the success of ather workers in this field, has, by Mr. Tosla's invention, been

Apparentes of neck auditate dimensions enables his to shift the

255

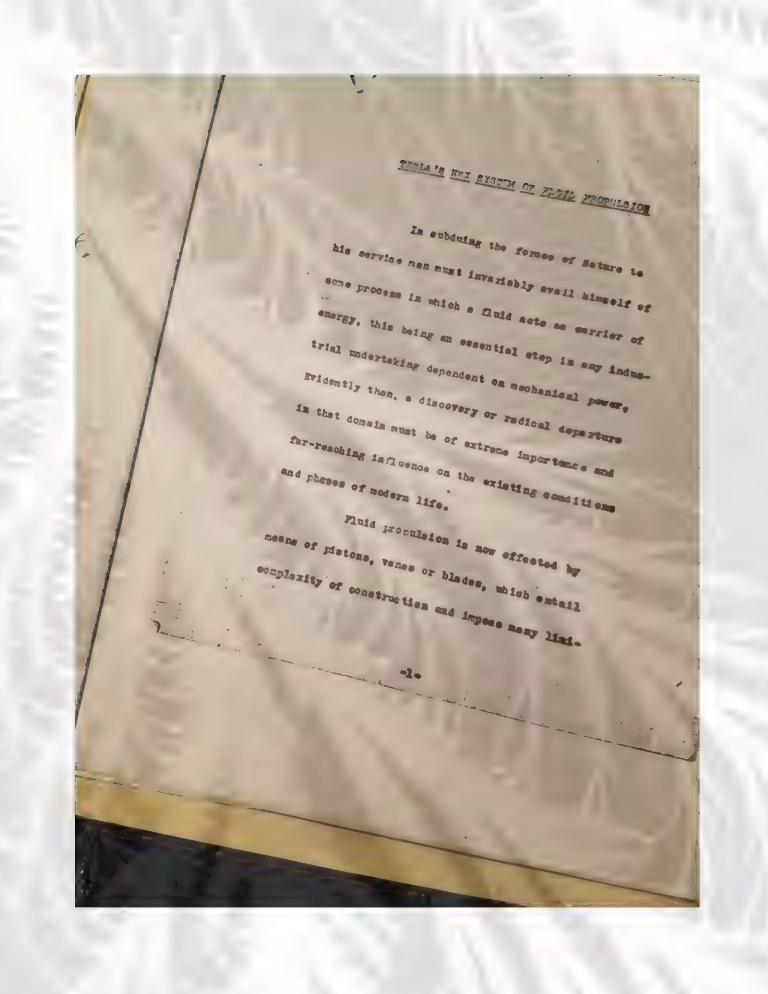
enter interest the simener possibilities of and of the toak the starting prediction that the second the electric fixation of atmospheric hetrigen would before long develop into an industry seed to that of ires in suportains. It they hall so thing his hear Arm boraids concernial applotation. How hise wis his forcesights : in plants have been surfalled source and produced for her have Howay the south the south party on guirfer sullioning housen and fredering the solling house of the south the south to the south the sou methor sad affarely subilising, no more than de from persone first cost so great to halfe of the correct, and welland forface for cost of really at rection to capital of at morphise his brogen free filled accommenced to the first or turning of at morphise his brogen free; first the house of lightway discharges which precipitale from four to healy founds of sitrogen hour compounds per acre per year, an enormous amount When considering four sourcedy into This high afflering is due to the greet point and deaner, large and volume of These o'deal sugarament are pulficled some the new forticed some forces, process, owned & the Toste Nikoles Compay. 4 The "Task Transformer" much je proper for allies & Leve the pending for an interest of described for surprise for the feeling of the described to described to describe the feeling for in-called tools considered to the feeling for parties to the feeling the declined of the differ of Nilrogen, coming the gen to combine me a lever separtilere y every.

attenuated are so necessary for the highest efficiency. Third, hy virtue of the peculiar nature of Mr. Tesla's transformer, he is enabled to produce a cortain tonnage of product with such a small amount of apparatus and a consequently reasonable investment on to multiply a thousand fold, the capacity officioney of his plent. This item is of west importance in connection with this subject. Hany experimenters have produced nitrio soid from the atmosphere and there are now some very large plants engened in this industry ser particularly in Sorwey, that Involves upwards of \$50,000,000 and which will about a some 200,000 horse. power the it is fully expended, but without exception all these efforts have resulted in a first cook of apparental so great that the interest and maintenance alone thereof puts a fixed shores . upon each ton of the product that hee horotofere rendered the business indifferently citizentiae to copital. Jenering, there for the moment, the increased efficiency eleined by to the novel method of burning the atmosphere and sometime The his day are spliced and sp spot becomes. If the operation of the labora There is no contribute of the same of the sam La. . . . 257 greek aboleslas spick has de madriculty matterfront will he success of the old method and applicated. 4. Tilles Mans for generaling enormous "stellene bressers with Experience of the fine of smerit de decessions secusion plante printicollow of die charges of ares of the great linght " and rolling to recovery to the highest efficiency of any capilly loveres great the buse the are a. Possed fold the effectiveness of the please. the Tosh appeared my he bitered have larbere reserving as a shapendown opend, while that was grand sor explosive it comparelle ha he save performence the letter is overpopular and expensive. The entry tringent to the contract ed of the * This has of vilet importance he The saturprise reducing as it does, he a mine mine the first and the burden of charges. To : Clusterel , man that disregarding x x (other or le)

part to replace to replace to replace of the series of in fact, most of it is good for one to lead good on aiste principally of brick brildings, transfermery, brick or tile com Martin chembers and corinpins powers on their covins lest. The process is a centinuous one and once started requires no manuel labor, to cleaning continuing to burn the atmosphere into nitric fumes, which in turn combine with water to make nitric ecid, and this goes on until the electric current is switched off, and impeliately recommendes when the current is spain switched on. # That is no loss upon the discontinuing of the process for an hour a say, a month or a year, other that and due to plant lying idle and carrying fine out interest. It is obvious, therefore that it calls concluded abtain process at a sufficiently to the market of the market of industry of the second industry of the Same with a very reasonable investment of capital yielding annually a return many times the first coet. The Tesla Bitrates Company owns the exclusive rights under the United States patents granted to En Teslagarplicable to the manufacture of nitrates from the atmosphere. Double on & following:) of one of our states that they shall be to relative to this subject, and in for he heaping his anchorage and the for he heaping his anchorage and the first advised in the immediate vicinity of New York City, where experts and investors may see for the malues the practical application of these inventions in heart for heart and apparatus. In making this toot, the Tenla will have at his disposal, a plant that her electry cost over \$200,000, a large part of which will be implicately available. Kit is estimated that the ball involve an expenditure of \$25,000 cm-ch.

change of the allitional apporator, partly for attendance and of affection and martly for the very fill and antended demonstrate tion which it is proposed to be said belong the latest ingreation which it is proposed to be said. form to her application on the large scale contemplated. xxi. 4. Teste is an devoting burself the perfection of places of months and being the formation of the soul of a same house of the place of the place of the formation of the forma a boy experience in the fixation of N' croper by the old redded and a thorought four l'a will all some feets perlaining to the accompany are sele of the fooduces, in the new home XX * 4 A





TESTA .8 HAT SASLIN OL STRIP BEOMITSION

In subduing the forces of sature to
his service men must invariably eveil himself of
. Some process in which a fluid acts as cerrier of
energy, this being an essential step in any industrial undertaking dependent on mechanical power.
Evidently them, a discovery or radical departure
in that domain must be of extreme importance and
far-reaching influence on the existing conditions
and phones of modern life.

Fluid propulation is now effected by mosne of pistons, vanue or blades, which entail complexity of construction and impose many limits

totions on the propelling as well as propelled mechanism and its performance. Tosle has dispensed with these devices and produced mechanism of extraordinary simplicity which, moreover, are in many other mespects superior to the old types univercally employed. A few words will be sufficient to convey a clear idea of his invention.

presence two salient properties: adhesion end viscosity. Owing to the first it is attracted and clings to a metallic surface; by virtue of the second it resists the separation of its own particles. As an inevitable consequence a core

tein crount of fluid is dragged elong by a body propolled through it; conversely, if a bedy be placed in a fluid in motion it is impelled in the direction of movement. The practical forms of Teals 's appearatus consist of flat, circular disks, with control openings, mounted on a chart and enalcoed in a casing provided with ports at the peripheral and central portions. Then derive ing energy from any kind of fluid it is admitted at the periphery and escapes at the centre; when, on the contrary, the fluid is to be energised, it enters in the centre and is expelled at the . . periphery. In either case it traverses the inpower being derived from, or imparted to it.

by purely molecular estion. In this novel mannor the host energy of steem or explosive mixtures can be transformed with high economy into mee handeal effort; motion transmitted from
one shaft to another without solid commettion;
vessels may be propolled with great speed; water raised or air compressed; an almost perfect
vacuum can be attained, substances fresam and
games liquefied.

while this improvement has the broadness and applicability of a fundamental moshanical concept, the widness field for its

ecame roisl exploitation is, obviously, the thermsdynamic conversion of energy.

mover is determined by its efficiency, specific performance relative to weight and epoce occupied, chespasses of manufacture, safety and reliability of operation, adaptability to countraction is large unite, espability of running at high peripheral velocity, reversibility, and a number of other features of losser importance. In the empority of these a machine, operating on the new principle, exocle. But there is one quality which is meet desirable in a thermo-dynamic transfermer from the

anne to deterioration and impairment of efficiency by heat.

of such vital bearing on the efficiency of primemovers that it is of personnt importance to extend
the thermal range on for as practicable. In the
present state of the art redical progress towards
more commical transformation of the energy of
fuel can only be schieved in that directions such
being the case, the expability of the machine to
withstand deteriorating effects of great heat is
the controlling factor in determining its conmercial value. In that most demired quality the

heat notors. The Diesel and other internal conbest notors. The Diesel and other internal conbestion engines are fitally limited in this respect by their complete dependence on elecely
fitting sliding joints and unfailing supply of
clean lubricant; while in the present forms
of turbines buckets, blades and inherent mechanical deficiencies impose similar restrictions. These parts are too delicate and periabable to serve as elements of a gas turbine and
this has been the main chatacle in the way of
its successful realisation. The reter of the
feels turbine presents a relatively energone.

the fluid, instead of striking against the propelling organs in the wavel destructive manner, flows
parallel with the same, imparting its momentum by
admaton and viscosity instead of impact. Moreover,
it has been shown that the efficiency of this form
of rotor is not impaired to any appreciable degree
by a roughening of the disks and that it operates
estisfactorily even if the working medium is corrosive to an extent.

motive power under certain standard conditions, sottled upon in the course of time, gradually forced upon the minis of engineers the makine

Cycle Efficiency as criterion of performance and long continued endeavors to improve the same have finally resulted in complex multistage constructions entirely unsuitable for high temperatures.

The fools turbine, by virtue of its exceptional hast-resisting and other unique properties, makes possible the attainment of great fuel economy with but a single stage, incidentally offering the additional advantages of an extremely simple, enable, compact, and reliable mechanism. But perhaps the chief commercial value of this new primemover will be found in the fact that it can be specified with the cheapont grade of crude oil, colloided fuel, or powdered coal, containing con-

siderable quentities of grit, sulphur and other impurities, thus enabling west sums of mency to be saved annually in the production of power from fuel.

the feels turbine also lends

itself to use in conjunction with other types.

especially with the Persons with which it forms

an ideal combination. Although its practicalintroduction has been delayed by the force of

circumstances, a number of years have been

epent in exhaustive investigations and experiments on the basis of which the performance
in any given case can be alonely calculated.

The first public tests were made before the

of the Now York Edison Scapeny where several modifies, ranging from 200 to 5000 hope, were installed and operated with satisfactory results. That the invention was appreciated by the technical profession may be seen from the excerpts of statements by experts and periodicals printed on the amend page.

The calient advantages of the feels turbine may be summed up as follows:

present primmovers is the Diesel engine.

But, quite epart of many practical and com-

mercial drawbacks, inseparable from this type, it is entirely dependent on comparatively expensive oil, so that the Toole Gas Turbine, working with auch chosper fuel, would have the better in competition even if its officlency so a thermodynamic transformer were approximally lower, all the serese in view of its greater mechanical perfection. Referring to turbines, all of whish we ourposed by the Persons in comcay so well so extent of use, definite linits have already been reached and the only possibilities of saving fuel exist in the employment of stem at very high superheat 423u

Ent none of the primemovers mentioned is

But none of the primemovers mentioned is

adapted for such operation and although every

effort has been made in this direction, ne

signal success has been achieved. The super
heat is at most 250° F, this being considered

the maximum permissible. All attempts to con
alderably extend the thermal range have falled

chiefly because of the inability of bucket

attructures to withstead the action of intense

heat. The reals Turbics can operate quite

estisfactorily with the notive agent at very

high temperature and, owing to this quality.

lepde itself emonosingly well to these purposes.

emperior to all other forms. Each disk is virtually the equivalent of a whole bushet wheel, and as many of them take up but a small width the output of the machine, considering its weight and size, is surprisingly great. This, while not being a measure of efficiency, is according to a property less a feature of considerable importance in many instances.

on be produced without a cingle manhined port except the shaft, all the disks being punched

and the comings pressed. By this method, with proper amchinery installed on a large scale. the cost of production many be reduced to a figure never decaded possible in the construction of an engine. What is more, this can be done without material scorifice of efficiency as small observaces are not essentially required.

SAFETY AND RELIABILITY OF OPERATION: There is an ever present danger in the running of high speed numbines. A bushet turbine may at any

moment run away and wreck the plant. Such aceidente have happened again and again and this peril has often proved a deterrent to investment.

i remarkable quality of this turbine is its complete sofety. As regards the mear and tear of
the propalling organs it is significant and, in
any event, of no consequence on the performance.

ADAPTABILITY TO CONSTRUCTION IN LARGE UNITS: In all the present menhines there is a distinct limit to capacity, for although large units can be manufactured, they are very costly and difficult to manage. The new turbine is so simple and the entity to large that the limits in this direction can be greatly extended.

EVELTAVOR TO DESCRIPTION BY HEAT AND OTHER

wholving advantage over the eld types in which
the maintenance of smooth surfaces and sharp
edges is indispensable to efficient working.
In the reals furbine, for the reasons already
stated, the destructive actions of heat and
corresive agents are much less presourced and
of mistively negligible effect. This fact
has a most important bearing on the saving of
fuel.

CAF'RILITY OF RUSHING AT HIGH PURIPEURAL SPEED! In this respect also it is superior to others. The rotating structure carries as load and is expollently adapted to withstand tensile

etremses. Judging from the most recent tur
bine practice this quality should be of spe
eigh value.

greatly handicapped by their inempability
of reversal which is a very serious defect
in certain applications, as the propulsion
of vessels, necessitating the employment of
curillary turbines which detreats from the

propulsive power and adds materially to the

cost of production and maintenance of the

equipment. The Tesla Turbiae has the unique

property of being reversible, not only this but it operates with the same efficiency in either direction. For marine purposes it therefore constitutes an ideal motor whether used alone or in conjunction with older types.

other desirable features, comptractive and eperotive, which will add to its value and adaptebility to many industrial and commercial uses
es, railroading, marine mavigation, serial prepulsion, generation of electricity, refrigeration, sparetion of trucks and automobiles, hydreulic gearing, agriculture, irrigation, mining and similar purposess.

ENTURE VICTOR OF UNITARIOUS OF CASIS AND THE

C. B. Richardo. Proforms Emeritus of Mechanics. Yale University:

"I am account at the development of pour given by

To the the and stored by the exhibit."

F. Sargent, Chief Engineer and Tubbies import: "I am impressed

with the newmon and neverty of the underlying principle of this invention. It is such as will chain
the attention and admiration of myone of a scientific turn of mind is a mechanical direction."

Raymold Janney, Chief Engineer, thiverest Transmission Co: "It is

Erigndier Allen of the far Department: "Samething new in the worl

Exignoise Allen of the the personal: "Something new in the world-Officers are greatly improceed with it."

Filler were Euthineen, Chief Engineer: "It is the greatest inven-

Athold Trinyi. Chief Engineer. Oelfeurungs-Gusellschaft. Gemeny:

The ideal of the turbins engine."

B. R. T. Collins (Euror Plant Respondent): "It is a wonderful turbine."

The Ector World: "The new principle unquestionably is a great conetaibntion to solence and engineering, great in its

claphicity and broadth of application."

Scientific American: "Considered from the mechanical standards.

the turbins is estenichingly simple and conomical
in construction. Should prove to pressess such a dorin construction, should prove to ressees such a dura ability and freeden from wear and busedown as to

Person it, in these respects, for in advance of any type of atom of gas meter of the present day."

Engineering Magnetor "An entirely new form of prime mover with interesting possibilities."

Technical North Magnetor: "The Tools Turbins is the spotheosis os simplicity. It is no violently opposed to all present. I that it seems unbelievable."

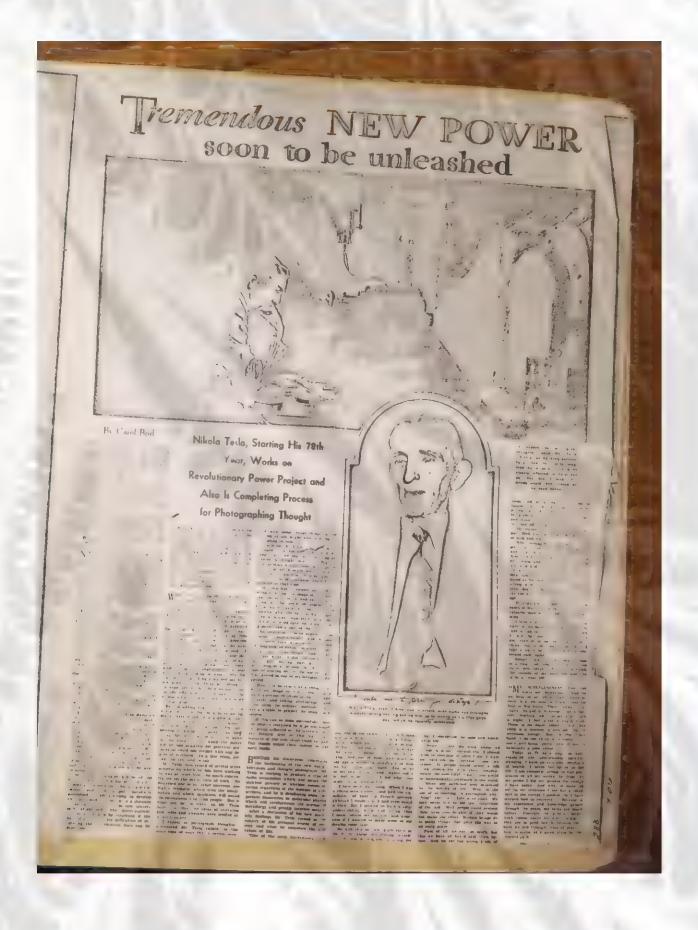
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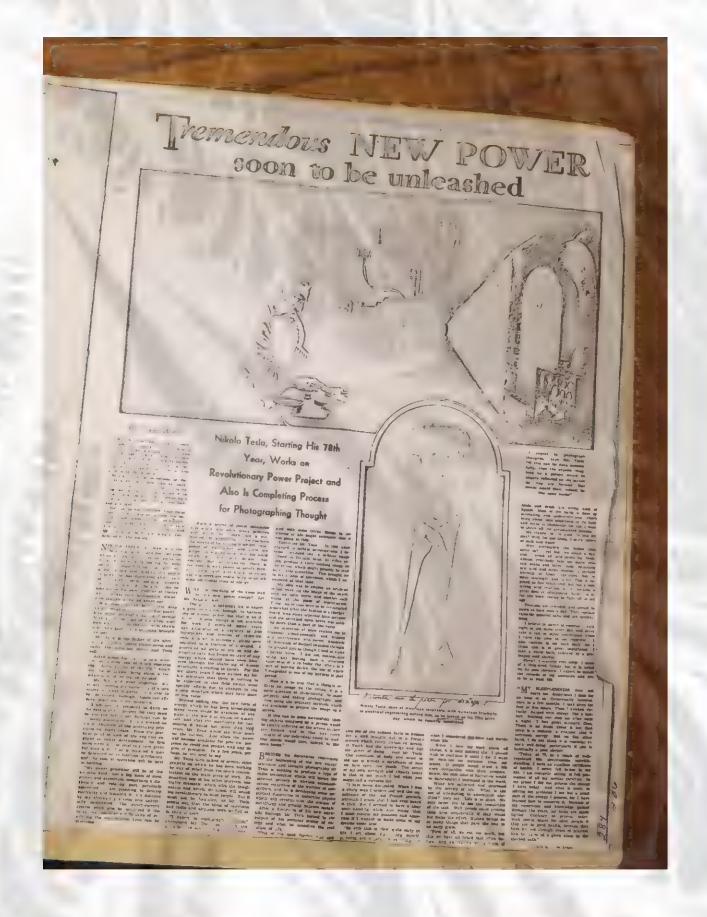
"The turbles is different in principle to any heretefore in nes and one which will tale loss rome and for a continuous the trace engine has remained and in a continuous and a continuous to the point of stage of the form of the continuous to the point of stage of the form of the continuous to the point of stage of the form of the continuous to the E. Loudding monenical principle".... ato. ato.

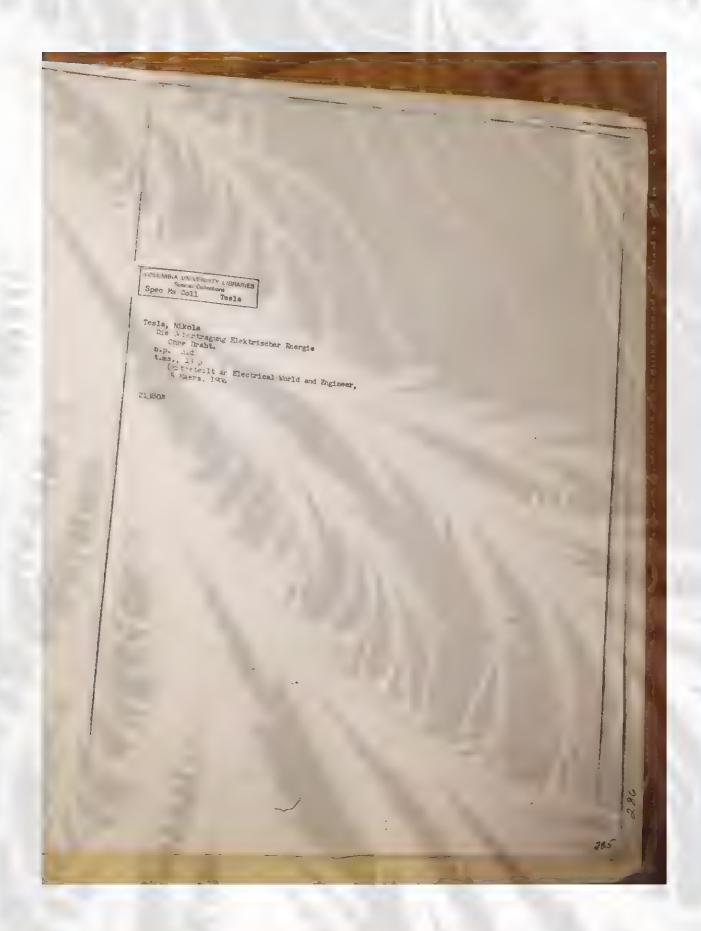
RARE COR & BAYLARIPT LIBRARY Spec Ms Coll Tesla Tesla, Nikola

Tremen'ous new power coon to be unleashed by Carol Bird
n.r., [Sept. 123.]

a.ms., lp. (comment written by N. Tesla under his picture
in this writche published in the Fhila. Fublic Ledger,
"account Section, p. 6, 10 Sept. 1933) 21380E







Spec 1

DI UTLE TRACTIC ILLETTISCIER DIERGIE OLD DEART.

Tesla, Dic (Mi .1: an Electrical World and Engineer, 5 Macrz, 1:0'.)

Von Nikola Tesla.

21,3803

cincr & legenhed: rem re arrawer Bedenhang in den Leben Ihres Jourrals, p. 1 .stehn. Ihr Erief hat die Erimerung an unsere beginnat francoaft, andie ersten anvollkommenen Versche und unvernat har felte, Gefaelligkeiten und liesverstaendnisse, ne 1 belebt.

2 1 .md., acht die Kleinheit der Verarklichungen im Bedenheit der
ins Gedaesinnis gerufen. Die folgenden Zeilen, welche, weeren
nicht wegen Ihrer Ange ung, vielleicht eine lange Zeit der Oeffentligetkeit noch nicht gebergeben worden waeren, sind ein Anerbieten
in der fre andlichen Stimmung von Alters her, und meine besten zuensche auf Ihren Zukuenfilen Erfolg begleiten sie.

Some Forschung, der ich seit Juhren obgelegen hatte in der Absicht eine Methode elektrischer Energieusbertragung durch das natuerliche Medium zu vervollkommen, zu der Erkenntnis drei wichtiger Erfordernisses erstens, die Entwickelung eines Semers von grosser Kraft; Eweitens, die Vervollkommung von Mit eln zur Individualisierung und Absonderung der ueb rtragenen Energis; und, drittens, die Foststellung der Gesetze der Fortpflanzung von Stromen durch die Erde

und die Atmosphaere. Verschiedene Gruende, von denen nicht der G. fingste die mir von meinem Freunde Leonard E. Curtis und der Colerado Springs Electric Company angebotene Hilfe war, bewogen wich, fuer meine experimentellen Untersuchungen das grosse plateau, zwei tuns end Meter weber der Mecresflacche, in der Nache dieses reizenden Kurertes zu wachlen, welchen ich spaet im Mai 1899 erreichte. ha m car ich cinige Tage dort gewesen, als ich mich schon zu der Hoklich to Wahl Gratulieren konnte, und ich begann die Aufgabe, 1 . Riche ich mich lange weschult hatte, mit dankbarem Sinne und voll begeisternder Hoffnung. Die vollkommene Reinheit der Luft, die unvergleichliche Schoenheit des Himmels, der erhabene Anblick enner hohen Gebirgskette - alles rund unher trug dasu bei, die Bedin ungen fuer wissenschaftliche Beobachtungen ideal zu machen. Dazu kam noch der belebende Rinfluss eines her-lichen Klimas und eine cigenartige Verschaerfung der Sinne. Die Organe unterzichen sich in jenen Regionen merklichen physikalischen Veraenderungen. Die Augen nehmen wine ausserordentliche Klarheit an, was die Sehkraft verbessert; die Ohren trocknen aus und werden empfindlicher gogen Schall. Non kann dort Gegenstaonde auf schon grosse Entfernungen unterscheiden, dass ich vorziehe, dise von jemend anders nennen zu lassen, und ich habe - dies kunn ich zu bezeugen wagen sieben und acht hundert Kilometer weit entfernte Donnerechlaege gehoert. Ich haette sie auf noch grocssere Entfernungen hoeren Moennen, wenn es nicht langweilig gewesen waere, die Ankunft der Laute,

die nach bestimmten Zwischenraeumen erfolgte, genau wie sie - fast eine Stunde im Voraus - von einem elektrischen Anzeigeupparat angekuendet wurde, zu erwarten.

In der Mitte des Monats Juni, wachrend Vorbercitungen auf undere Arbeit vor sich gingen, stellte ich einen meiner Empfangstransformatoren auf in der Absicht, auf eine neue Weise, experimentell, das elektrische potentiell der Erdkugel zu bestimmen und dessen periodische und gelegentliche Schwankungen zu beobachten. Dies war ein Teil aines sorgfaeltig im Voraus entworfenen Planes. Eine houghst empfindliche, sich selbst wiederherstellende Vorrichtung, welche ein registrierendes Instrument kontrollierte, was in den sekundaren Stromkreis eingeschaltet, wachrend die Primaere mit der Erde und mit einem erhobenen Pol von regulierbarer Kapazitaet verbunden war. Die Variationen des Potentiells verursachten elektrische Wogungen in der Primaere; diese erzeugten sekundaere Stroeme, die wiederum auf die empfindliche Vorrichtung und den Registrator im Verhaeltnis zu ihrer Intensitaet einwirkten. Es stellte sich heraus, dass die Erde buchstaeblich mit elektrischen Schringungen belebt war, und bald var ich fast gaenzlich in dieser interessenten Forschung vertieft. Bessere Gelegenheiten zu solchen Beebeachungen wie ich zu machen beabsichtigte koemten nirgende gefunden werden. Colorado ist ain Lang, das wegen der Entfaltung matuerlicher elektrischer Kraft beruchmt ist. In der trockenen und verduennt en Atmosphaere scheint die Sonne mit grimmiger Intensitaet

auf die Gegenstaende herab. Idh entwickelte Dampf bis auf einen gefachrlichen Druck in mit konzentrierter Salzloemung gefuellten Faessern, und die Staniolueberzuege einiger meiner erhoehten Pole schrumpften in der feurigen Glut zusammen. Ein experimenteller Hochspannungstransformator, der unvorsichtigerweise den Strahlen der untergehenden Sonne ausgesetzt worden war, wurde durch das herwisschmelzen der Isolationsmischung verdorben. Die Trockenheit und lucmheit der Luft trægt dazu bei, dass das Wasser wie in einem Kessel verdampft, und statische Elektricitaet en twickelt sich . a grosser Monge, Blitsentladungen sind demgemaese sehr Hasufig un: mitunter von unbegreiflicher Heftigkeit. Bei einer Gelegenhalt funden in zwei Stunden ammzehernd awoelf tausend Entladungen statt, und alle in einem Radius von gewies weniger als fuenfzig Kilometer von Leboratorium. Viele derselben glichen riesenhaften Basumen aus Feuer mit den Staemmen nach oben oder unten. Kugelblitze habe ich nicht geschen, aber als Belchmung fuer meine Enttacuschung gelang es mir spacter, die Art ihrer Bildung zu bestimmen und eie kuenstlich su erseugen.

Am Ende desselben Monats benerkte ich mehrere Male, dass
meine Instrumente durch Entladungen, die in grosser Entfernung
stattfunden, staerker beeinflusst wurden, als durch solche in der
Hache. Das war fuer mich ein grosses Raetsel. Was war die Dressche? Eine Reihe von Beobachtungen bewies, dass es nicht von den
Unterschiede in der Intensentitaet zwischen den einselnen Entladus-

gen herruehren konnte, und ich stellte leicht fest, und ich etellte leicht fest, dass das Phaenomen nicht das Resultat eines variierenden Verhaeltnisses zwischen den Perioden meiner Empfaen erstromkreise und denen der irdischen Stoerungen war. Eines Abends, als ich mit einem Assistenten heimging und ueber diese Erfahrungen nachsann, ueberwaeltigte mich ploetzlich ein Gedanke. Vor Jahren, als ich ein Kapitel meines Vortrages vor dem Franklin Institute und der Rational Electric Light Association schrieb, war er mir auch eingefallen, aber ich hatte ihn als absurd und unmoeglich verworfen. Ich verbannte ihn wieder. Nein Instinkt wer jedoch vach verufen, und ich fuehlte irgendwie, dass ich mich einer grossen Offenbarung nacherte.

Es war am dritten Juli - das Datum werde ich mie vergeseen als ich den ersten entscheidenden, experimentellen Beweis einer
Wahrheit von usberwaeltigender Wichtickeit fuer den Fortschritt der
Menschheit erhielt. Eine dunkle, stark geladene Wolkenmasse sammelte sich im Westen. Gegen Abend brach ein heftiges Gewitter los,
welches, nachdem es einen betraechtlichen Teil seiner Gewalt in den
Bergen von sich gegeben hatte, mit grosser Geschwindigkeit ueber
die Ebene dahingejagt wurde. Dieke und lang anhaltende Bogen bildeten sich in fast regelmaeseigen Zwischenraeumen. Meine Beobachtungen waren nun sehr erleichtert, und die schon gewonnenen Erfahrungen machten sie gennuer. Ich war imstande, meine Instrumente
schnell zu manipulieren und ich war vorbereitet. Da der Registrie-

apparat richtig ajustiert war, wurden seine Anschlasge mit der sunehmenden Entfernung des Gewitters schwaecher und schwascher, bis sie gaenzlich aufhoerten. Ich beobachtete in begieriger Erwartung. Und wirklich, nach einer kleinen Weile fingen die Anschlaege wieder ane wurden staerker und staerker und, nachdem sie ein Maximum usberschritten hatten, wurden sie allmachlich schwaecher und hoerten wieder auf. Viele male wiederholten eich dieselben Wirkungen in regelmaessig wiederkehrenden Zwischenraeumen bis der Sturm, der, wie einfache Berechnungen erwiesen, sich mit fast gleichmaessiger Gesch-indigkeit bewegte, sich auf eine Fatfernung von etwa dreihundert Kilometer zurueckgezogen hatte. Und auch dann liessen diese seltsamen Wirkungen noch nicht Bach, sondern fuhren fort, sich mit unverminderter Staerke zu offenbaren. Spaeter wurden achnliche Beobachtungen auch von meinem Assistenten, Herrn Prits Loewenstein, genacht, und kurs nachher boten sich mehrere vortreffliche Gelegenheiten dar, die das wirkliche Wesen des wunderbaren Phaenomens noch kraeftiger und unverkenndar an den Tag brachten. Es blieb kein Zweifels Ich beobachtete stehende Wellen.

Indem die Quelle der Stourungen sich fortbewegte, kan der Empfacegerstromkreis macheinander auf ihre Knoten- und Bauchpunkte. So unmoeglich es auch schien, verhielt sich Cleser planet, trots seines gewaltigen Dafanges, wie ein Leiter von beschraenkten Dimensionen. Die ungeheure Bedeutung dieser Tatsache fuer die Uebertra-Gung von Energie nach meinem System war mir schon gans klar geworden. Nicht nur war es moeglich, ohne Draht telegraphische Botschaften nach irgendeiner Entfernung zu senden, was ich schon vor langer Zeit erk unt hatte, sondern auch die schwachen Modulationen der menschlichen Stime konnten der ganzen Erdkugel aufgepracht werden, und vielmehr noch, man konnte Kraft in unbegrenzten Quantitaeten and jede beliebige irdische Entfernung und fast ohne Verlust uebertragen.

Hit diesen erstaunlichen Moeglichkeiten in Aussicht, mit dem examinat. Hen Beweise vor mir, dass ihre Verwirklichung von nun an nur eine Frage von Fachkenntnis, Geduld und Geschicklichkeit war, nahm ich die Entwickelung meines Sendemultiplikators kraeftig in Angriff, jetzt jedoch nicht so sehr mit der urspruenglichen Absicht, einen solchen von grosser Kraft zu erzeugen, sondern vielmehr zu dem Zwecke, den besten konstruieren zu lernen. Dies ist im Weschtlichen ein Stromkreis sehr hoher Selbstinduktion und geringen Widerstanies, den man wol einem typischen, in der Telegraphie mit Hertzechen oder elektromagnetischen Wellen benutzten Strombreise als gerade ontgegengesetzt bezeichnen kann. Es ist schwer, sich von der wunderbaren Kraft dieser eigenartigen Vorrichtung einen Begriff zu machen. Da die elektromagnetischen Strahlungen auf eine unbedeutende Quantitaet herabgesetst und richtige Rezonansverhaeltnisse aufrecht erhalten werden, wirkt der Stronkreis wie ein ungeheures Pendulum, indem er die primaeren Erregerimpulse unbegrenst aufspeichert und der Erde und ihrer leitenien Atmospheere gleiche

foermige harmonische Sohringungen aufpraegt, deren Inten itaeten, wie fräliche Versuche gezeigt haben, so weit getrieben merden koemen, dass sie diejenigen, welche bei der natur-lichen Entfaltung statischer Elektricitaet erreicht gerden, vebertreffen.

Chetchzeiti, mit eiesen Bestrebungen wurden auch eie Mitcel der Individualisierung und Absonderung der Energie allemehlich vertessert. Grosse Wichtigkeit wurde dieser Arbeit beigemessen, com es fund sich, dass einfaches Abstiamen nicht hinreichte, un den stronger probatechen Erfordernissen gerecht zu gerden. Die fundam - le Idee, zu Zucche der Absonderung der gelertragenen Energie eine Anzani absonderlicher, koperativ vereinigter Elemente anzumenden, fuchre ich direkt auf meine Lektuere von Spencer's klurer und anregender Auslegung des in nachlichen Hervenmechanismus zurueck. Welchen Einfluss dieses Prinzip auf die Uebertragung von Intelligenz und elektrischer Energie im Allgemeinen haben wird, kann jetst noch nicht abgesoluetzt werden, denn die Kunst ist noch im Keimsustandes aber die gleichzeitige Uebermittelung von tausenden von telegraphischen oder tele honischen Botschaften durch einen einzigen Leitungskanal, sei er natuerlich oder kuenstlich, ohne gefachrliche Greenseitige Stoerung, ist goviss tunlibly waehrend Millionen moeglich sind. Andererseits kunn durch Amsendung einer grossen Ansahl kooperativer Elemente und willkuerliche Abbenderung ihrer absonderlichen Eigenseinsten und ihrer Reihenfolge ingen ein beliebigen Grad der Individualisierung erreicht werden. Aus augenscheinlie

chen Gruenden wird dieses Prinzip auch fuer die Erweiterung der Vebertragungsentfernung von Wert sein,

Der Fortschritt, obgleich notwendigerweise langsen, war bestaendig und sicher, denn die Ziele, nach denen ich strebte, wa-) on in der Richtung meiner fortwachrenden Studien und Taetigkeit. Es ist deshalb kein Wunder, dass ich schon vor Ende des Jahres 1899 die unternom ene Aufgabe beendete und die Resultate erreichte, welche ich in meinem Artkel im Century Hagusine vom Juni, 1900, in dem jedes Wort sorgfaeltig gewogen wurde, anzeigte.

Es 1st schon viel getan, um mein System kommerziellem Gebrauch zur Verfuegung zu stellen, sowol zur Uebertragung von Enerthe in kleinen Quantitaeten fuer spezifische Zwecke, als auch auf industriellem Maassstabe. Die von mir erzielten Resultate haben meinen Plan der Intelligenzuebermittelung, fuer welche der Name -Welttelegraphie vorgeschlagen worden ist, leicht ausfushrbar gemacht. Das Prinzip ihrer Wirkung, die angewandten kittel und ihre Anwendungsfashigkeiten bilden, glaube ich, eine radikale und fruchtbare Abwelchung von dem, was vorher getan worden ist. Ich habe keinen Zweifel, dass sie sich fuer die Aufklabrung der Bassen, be-Sonders in noch uneivilisierten Laendern und sohwer zugaenglichen Regionem, sehr wirksam erwisen, und dass sie zur allgemeinen Siecherheit, Bequemlichkeit und Wolsein, und der Aufrechterhaltung friedlicher Verhaeltnisse wesentlich beitragen wird. Sie bedingt die Anwendung einer Anzahl von Anlagen, welche alle imstande sind,

individualisierte Signale nach den aeussersten Grenzen der Erde zu senden. Jede derselben wird vorzugeweise in der Nache eines wichtigen Civiliaationspunktes gelegen sein, und die Nachrichten, welche sie durch beliebige Mittel und Wege empfasngt, werden nach allen Punkten der Erde geblitzt. Einegs billige und einfache Vorrieb-'ung, die man in der Tasche tragen koehnte, kann denn irgendwo auf See oder Land aufgestellt werden, und wird die Beuigkeiten der Welt, oder solche spezielle Depeschen, die fuer sie bestimmt sind, verseichnen. Auf diese Voise wird die ganze Erde so su sagen in ein riesiges Gehirn verwandelt werden, welches imstande ist, in jedem beile die Hitteilungen aufzunehmen. Da eine einzige Anlage von nur hundert Pferdestaerken hunderte Billionen von Instrumenten betae igen kann, wird das System ein tatsaechlich undegrenztes Arbeitsvermoegen haben, und miss notwendigerweise die Uebermittelung von Intelligens ungeheuer erleichtern und billiger machen.

Die erste dieser Centralanlagen waere schon beendet, wann sich nicht unvorhergesehene Verzoegerungen eingestellt haetten, die Jedoch gluecklicherweise nichts mit dem rein technischen Charakter zu tun haben. Aber dieser Zeitverlust, obaleich verdriesslich, due Tte sich schliesslich doch als ein Segen in Verkleidung erweis sen. Die beste mir bekannte Konstruktion ist gewachlt worden, und der Sender wird einem Wellenkomplex von einer gesenten maximalen Aktivitaet von sehn Millionen Pferdestaerken, von wilbharden Precent reichlich genug ist, "die Erdhugel zu umguerten", von sich geben. Der Effekt dieser ungeheuren Energienbgabe, fast zweimal so

viel als die gesamten Magaragefaelle, kann nur durch Anwendung gerässer Kunstgriffe, die ich seiner Zeit bekannt machen werde, erzielt werden.

Providence grossen Teil der Arbeit, die ich bis jetzt inn hale, habe ich der edlen Grossmut Herrn J. Pierpont Horgan's 2. verdanken, die um so willkommener und ermutigender war, weil sie zu einer Zeit gewacht wurde als diejenigen, die seitdem am meisten versprochen haben, die groessten Zweifler waren. Auch meinen Freund Stanford White mass ich fuer viele uneigennuetzige und wertvolle Hilfe danken. Diese Arbeit ist nun weit vorgeschritten, und wenn auch die Resultate verspactet sind, werden sie doch sieher kommen.

Die Vebertragung von Emergie auf industriellem Maasstabe wird mittlerweile nicht vernachlaessist. Die Canadian Niagara Power Company hat mir ein vorzuegliches Angebot gemacht, und eine fast eben so grosse Genugtuung als das Erringen von Erfolg der Kumst habber wird es mis verschaffen, ihre Konzession fuer sie finanziell vorteilhaft zu machen. In dieser ersten Kraftanlage, mit deren Entwurf ich seit langer Zeit beschaeftigt bin, beabsichtige ich, Zehn tausend Pferdekraefte unter einer Spannung von hundert Millionen Volt, die ich jetst mit Sicherheit erzeigen und haühaben kann.

Diese Energie wird usberall auf der Erde gesammelt werden, vorzugsweise in kleinen Quantitaeten, von einem Bruchteil einer bis

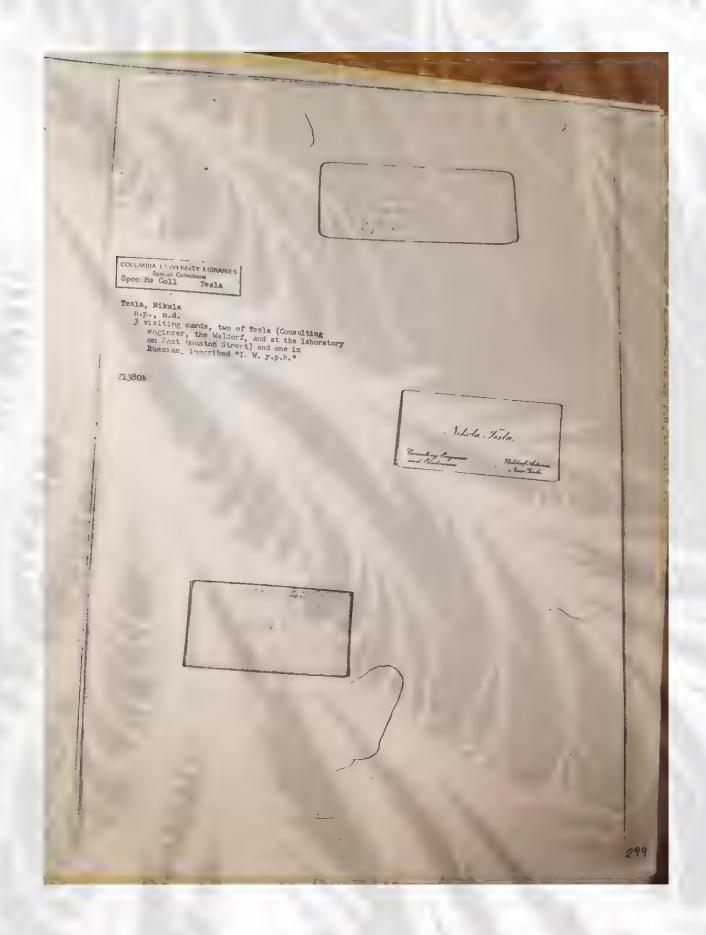
mchreren Pferdestaerken. Einer ihrer Hauptanwendungen wird die Beleuchtung vereinzelt gelegener Heimstaetten sein. De errorteit sehr wenig Kraft, eine Vohnung mit Vakuumroehren, die von Hochfrequenzatroemen erregt werden, zu erleuchten, und in jedem Falle wird ein ein wenig ueber dem Dach erhobener Pol hinreichen. Noch ein wertvoller Gebrauch wird das Antreiben von Uhren und dergleichen Apparate sein. Diese Uhren werden ausserordentlich einfach sein, werder absolut kiner Wartung beduerfen und werden genau die rich-'i. Zei engewen. Die Idee der Erde amerikanische Zeit aufzupraeper ist bezaubernd und wird schr wahrscheinlich populaer werden. Es giebt unzachlbare Vorrichtungen aller Arten, die entweder jetzt im Gebrauch sind oder geliefert werden koennen, und indem ich sie auf diese Weise in Betrieb setze, duerfte ich imstande sein, mit ciner Anlage von nicht mehr als zehn tausene Pferdestaerhen der ganzen Welt eine grosse Kommoditaet zu hieten. Die Einfuehrung die ses Systems wird Gelegenheiten gewachren fuer Erfindung und Fabrikation, wie sie sich noch nie vorher dargeboten haben.

Da ich der weitreichenden Wichti;keit dieses ersten Versuchs und dessen Finfluss'auf zukucnftige Entwickelung gewärtig bin, worde ich langsam und sorgfaeltig zu Verke gehen. Erfahrung hat mich gelehrt fuer Unternehmungen, die nicht gaenalich von meinen eigenen Jachigkeiten und Anstrengungen abhaengen, einen Termin festzusetzen. Aber ich bin voller Hoffnung, dass diese grossen Verwirklichungen nicht weit entfernt sind, und ich weiss dass, wenn dieses erste Werk vollendet ist, sie mit mathematischer Gewissheit

folgen werden.

-12-

Wenn die grosse, zufaellig enthuellte und experimentell bestaetigte Wahrheit voellig erkannt wird, dass dieser Planet, bei all seiner erschreckenden Unermesslichkeit, fuer elekt:ische Strosme tatsaechlich nichts mehr ist als eine kleine Metallkugel und dass infolice diesef Tatsache die Verwirklichung vieler Koeglichkeiten, von denen jede der Einbildungskraft spottet und von unberechenbarer Bedeutung ist, absolut sicher macht; wemm die erste Anlage in Betrieb gesetzt und bewiesen wird, dass eine telegraphische Botschaft, fast so geheim und unstoerbar wie ein Gedanke, auf irgend cine irdische Entfernung webertragen werden, dass der Schall der menschlichen Stimme, mit allen ihren Intonationen una Modulationen, getreu und augenblicklich an irgend einer andern Stelle der Brde wieder enzougt werden, dass die Energie eines Wasserfalles zur Lieferung von Licht, Waerme und Triebkraft, irgendus - auf See, oder Land oder hoch oben in der Luft - verwendbar gemacht werden kann, dann wird die Henschheit sein wie ein Ameisenhaufe, den man mit einem Stock aufgeruehrt hat: Sehet die Aufregung die da kommt?



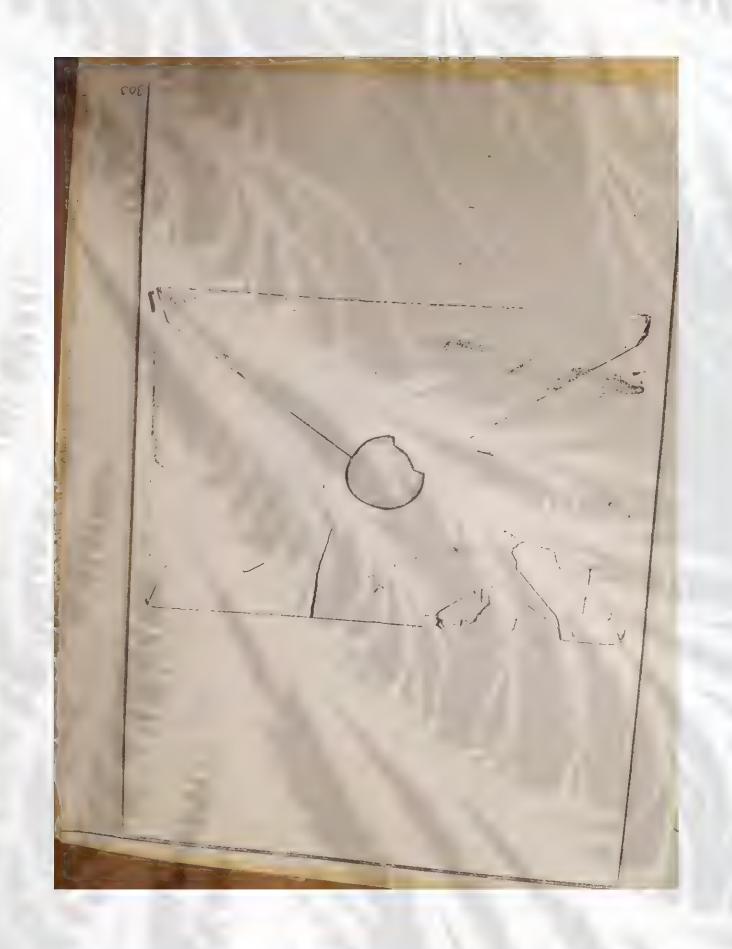
Minghow are Manyone aig. COLUMBIA LAIVERSITY LIBRARIES Spec Hs Coll Tesla Nikola Tesla, New York, 1900 Invitation card of the Players Club, signed by Tesla "Yay laden, face met,
By all the laws of was you're poundaged."
Song rashets Some st.
The Players,
16 Gramorcy Gark. The Players request the honor of your company on the afternoon of Monday. Speril the twenty third, from two until swo o'clocks
. M with complements of Mon Wikola Tealor
1900. This count will admit one living only
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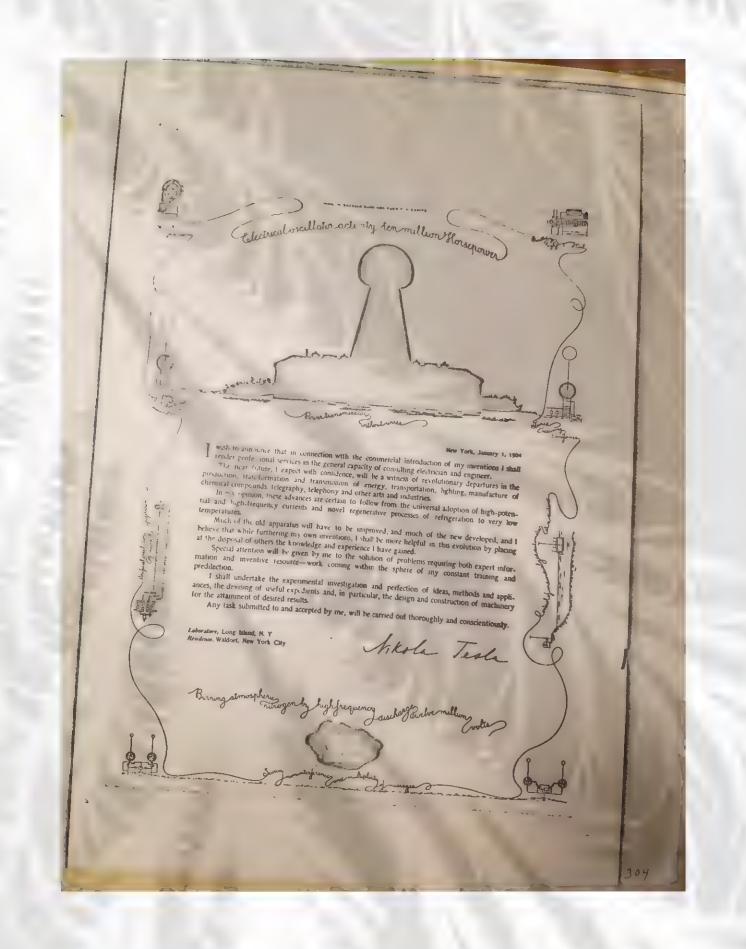
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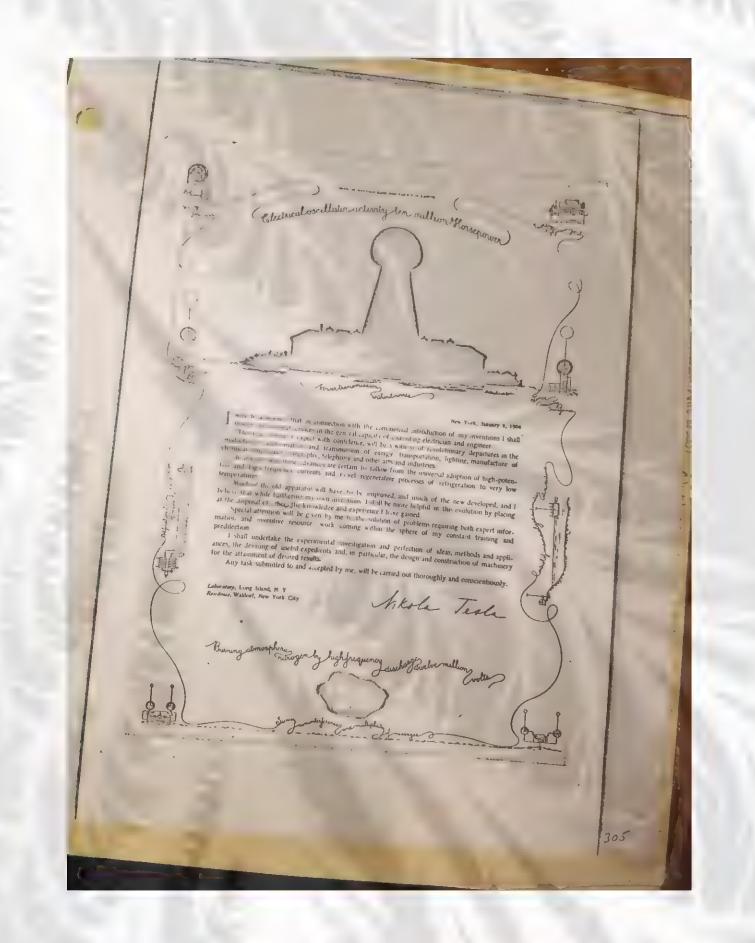
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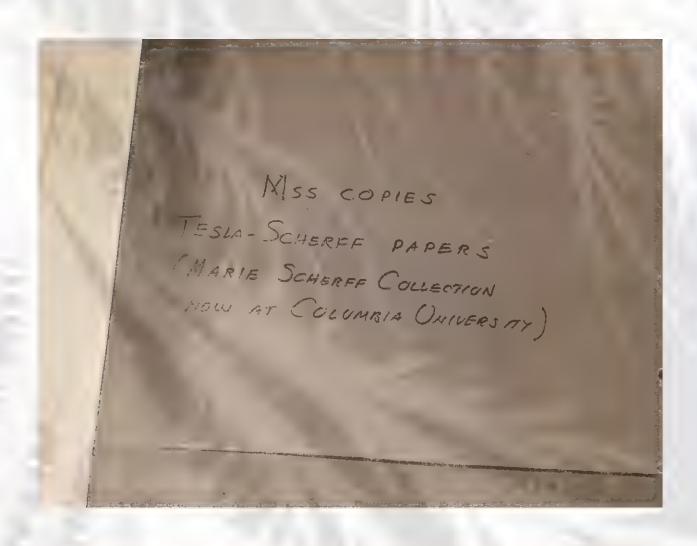
New York, 1 Jan. 1901
p.d.s., 3p. (announcement of his availability as consulting electrician and engineer; facrimilie signature; 2 copies with envelope addressed to George Scherff and bearing Tesla's wax seal) 21.3808

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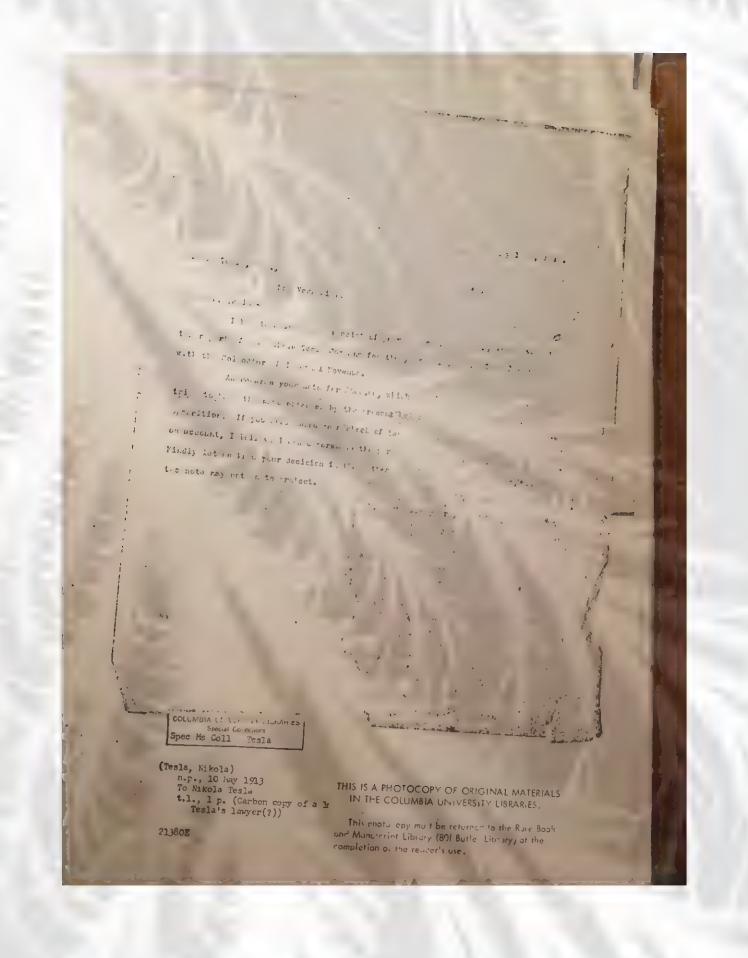
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eNikola Tesla, New York, 1900 Invitation card of the Players Club, signed by Tesla

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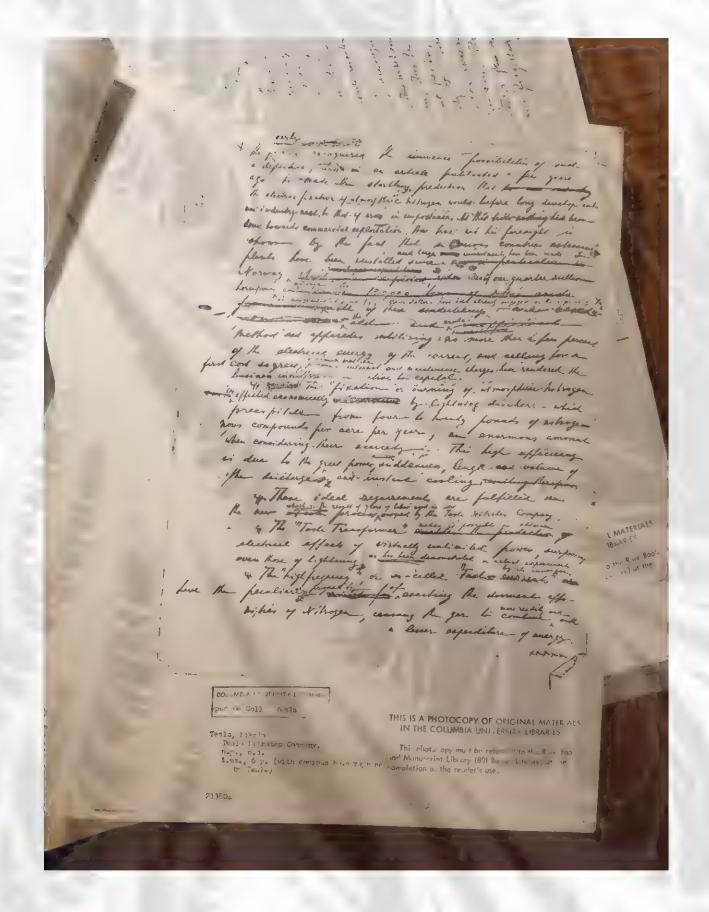
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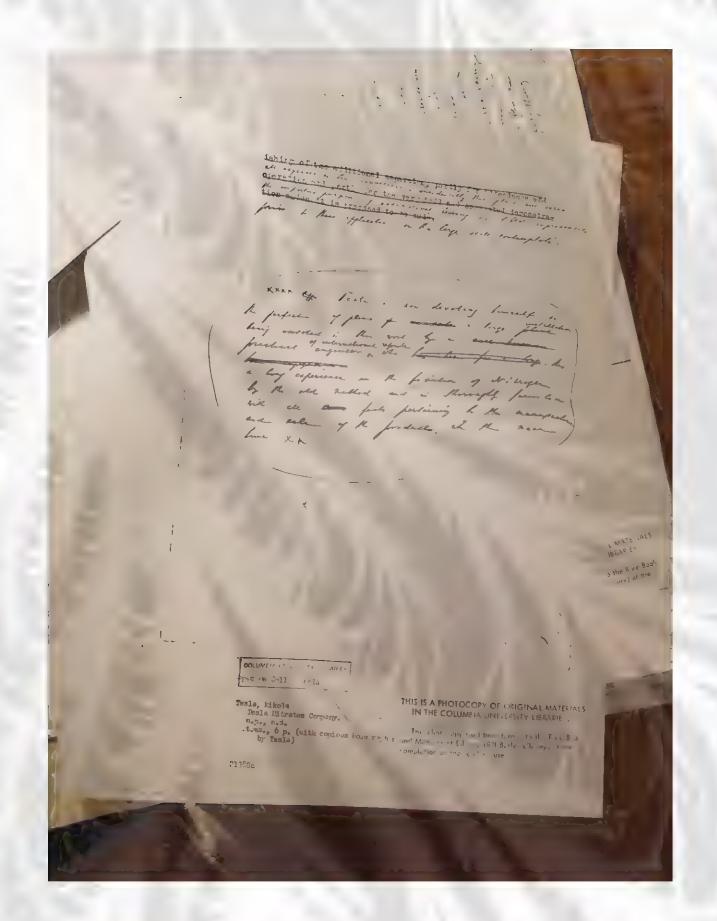


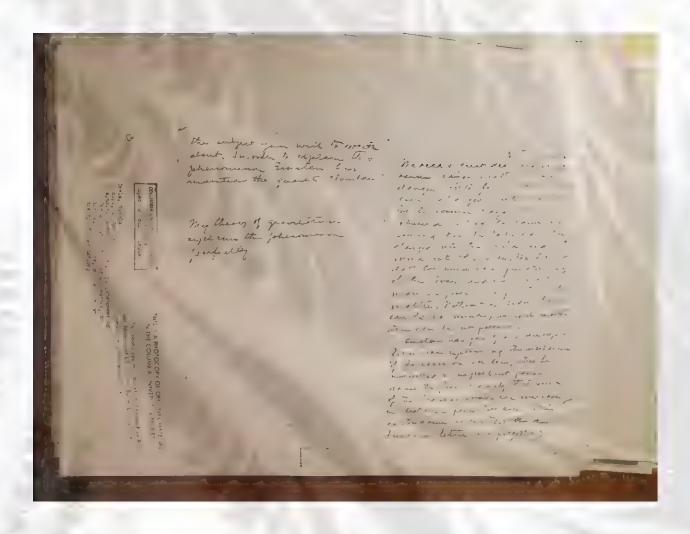
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subject to rapid deliceration in fact, most of it in good for comments principally of brick bush had been for the com-Separation charters and agriculty powers or their could have of the process is a continuous one and once started requires no rangel labor, the laboration of the street into nitric fumes, which in turn combine with water to make nitric acid, and this goes on until the correct is switched off, and immediately recommences when the current is a witched on. There is no loss upon the discontinuing of the process for en hour, a day, a month or a year, offer than the due to plant lying idle and carrying its trained interest It is abvious, therefore, that it was a firm a without present a sufficiently Fire with a very reasonable investment of capital yielding annually a return many times the first cost. The Tesla Hitrates Company owns the exclusive rights under the United States patents granted to the Tosla applicable to the manufacture of nitratos from the atmosphere. Which as the following; If one also own any frature the stay make a relative to this subject , and in get the temptis of in construct and and to is proposed to impediately make a demonstration of K caliand advantages y Re. lord process will a model flow on the semestial partition in the immediate violating of Res York MATERIALS BRARIES City, where experts and investors may see for themealess the the Rue Boot practical application of the inventions in the contract t , experence. In rubing this took, the Toule will have at his disposed, a plant that her should cost over \$200,000, a large pant of thich will be impliedely and imple: Kit is estimated that test will involve an expenditure of \$25,000 COLUMBIA L'IVERSITY LIBRANIES pec he Coll Tesla THIS IS A PHOTOCOPY OF OR GINAL MATERIALS Tesla, Mikola Tesla Hitrates Company. IN THE COLUMBIA UNIVERSITY LIBRARIES. ala Editrates Company.

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her York, 20 May 1903
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the first close of 1000, having worsel one year in the total of the a leathrighted, ritherweak, I experienced so that a leaff for recently by interrupted invertigations that, individual and a very termina a population by him. I leaf for new York to take up my laboratory work. But owing to prescing demands by several foreign scientific societies I made a trip to thrope where I leathred before the notification of Electrical Ingineers and Royal Institution in London and the Societe de Mysique in Mais. After this and a wrief visit to my home in Yugoslavia I returned to this country in 1912 capper to devote ignost to the subject of graditation of my thoughts: the study of the universe.

During the succeeding two years of intense construction.

I was fortunate enough to make two for-proceding discoveries.

The first was a dynamic about of gravity, which I have worked out in all details and how to give to the world way open.

It explains the causes of this force and the motions of heave by bodies under its inclusions so satisfactorily that it will get an end to idle apecuitions and folse conceptions, or that of curved space. According to the relativists, space has a tendency to curvature owing to an inherent property or presents of celestial bodies. Cranting a somblance of reality to this funtastic idea, it is still self-contradictory. Every action is accompanied by an equivalent reaction and the offices of the latter are directly opposite to these of the former.

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Tesla, Nikola
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Supposing that the bodies act upon the surrounding eneco causing curvatures of the same, it appears to my simple rand that the curved access must react on the bodies and, producing the opposite, straighten out the curves. These section and reaction are co-excistent, it follows that the supposed curvature of apace is entirely impossible. But even if it existed it would not appear the motions of the bodies as observed. Only the existence of a field of force can secretate for their and its assumption depends with space curvature. All literature on this subject is futile and destined to oblivion. So are also all attempts to explain the worldings of the universe without recognizing the critical of the other and the indispensable function it plays in the phone and.

By second discovery was a physical truth of the greatest importance. As I have convoled the orientific records in more than a lml? donon languages for a long than without finding the least anticipation, I consider nyrelf the critical discoverer of this truth, which can be expressed by the statement: There is no energy in matter other than that received from the environment. On my 70th birthday I made a brief reference to it, but its meaning and significance have become clearer to me since then. It applies rigorously to molecules and atoms as well as to the largest heavenly bodies, and to all matter in the universe in any phase of its existence from its very formation to its ultimate disintegration.

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Being perfectly satisfied that all energy in metter is drawn from the devergment, it was quite natural that then ratifactivity was discovered in 1600 I immediately started a secret for the external agent which caused it. The existence of radiometrity was positive proof of the existence of entermal rays. I had previously investigated various terrestrial Ci. on is uses africting wireless circuits but none of them or they others ensuating from the earth sould produce a steady o. ctained action and I was driven to the conclusion that the activating rays were of scomic origin. This fact I amounced in my papers on Roentgen rays and Radiations contributed to the Electrical Raylew of York, in 1837. However, as radiosectivity was observed equally well in other widely separated parts of the world, it was obvious that the ways rest be inpluging on the earth from all directions. Now, of all bodies in the Comes, our sun was rost likely to furnish a clue as to their origin and character. Before the electron theory ras advanced, I had established that radioactive rays comsisted of particles of primary matter not further decomposable, and the first question to answer was whether the sun is charged to a sufficiently high potential to project such particles and produce the effects noted. This called for a prolonged investigation which cultivated in my finding that the sun's potential was 816 billions of volts and that all such large and het heavenly bodies enit cosmic rays. Through

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further sclar research and observation of Hovae this has been proved conclusively, and to deny it would be like demying the light and heat of the sums. Economic as, there are suith the light and heat of the sums. Economic rays in deep restory, the of then declared recently that they must come from wary remote regions in which matter is converted into energy. I am sure that this is not true for there is no place, where much a process occurs in this or any other uni-

A few words will be sufficient in support of this conton'don. The kinotic and potential energy of a body is the
result of motion and determined by the product of its rese
and the square of volocity. Let the mane be reduced, the
energy is diminished in the same proportion. If it be reduced
to save the county is likuwise zero for any finite volocity.
In other words, it is absolutely impossible to convert asse
into a orgy. It would be different if there were forces in
mature capable of importing to a rass infinite volocity.
Then the product of zero rass with the square of infinite
volocity would represent infinite energy. But we know that
there are no such forces and the idea that mass is comport-

Thile the origin and character of the rays observed most the certh's surface are sufficiently well ascertained, the so-called consic rays observed at great altitudes presented

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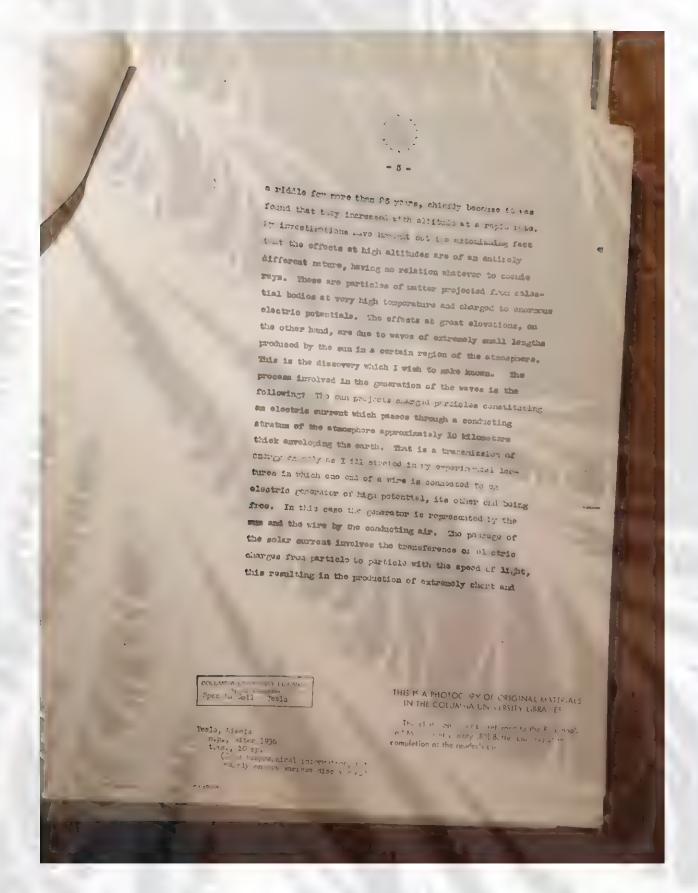
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ponetrating waves. As the air stratum mentioned is the course of the waves it follows that the so-called course rays observed at great sittendes rest increase as this stratum is approached. Wy researches and calculations have brought to light the following feets in this conmeeticas (1) the intensity of the so-called counte rays must be greatest in the southful portion of the atmosphere; (2) the intensity should increase more and more rapidly up to an elevation of about 20 idlometers where the emphating air stratum begins; (5) from there on the intensity should fall, first slowly and then more repidly, to an insignificant value at an altitude of about 30 kilomotors; (4) the display of high potential must occur on the free and of the terrestrial wire, that is to say, on the side turned away from the sun. The current from the latter is supplied at a pressure of about 216 billion volts and there is a difference of 2 billion volts between the illuminated and the dark side of the globe. The energy of this current is so great that it readily accounts for the surors and other phenomina observed in the atresphere and at the earth's surface.

For the tire being I must content nysolf with the amount of the salient facts, but in the course I expect to be able to give more or less accurate technical

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data relating to all particulars of this discovery.

To go to another subject, I have devoted much of my time during the year past to the perfecting of a new small and compact apparatus by which energy in considerable amounts can now be flashed through interstellar space to any distance without the slightent dispersion. I had in mind to confer with my friend George E. Halo, the great astronomer and solar expert, regarding the possible use of this invention in connection with his own researches. In the meantime, however, I am expecting to put before the Institute of France an Accurate description of the devices with data and calculations and claim the Pierre Carrier Prize of 100,000 france for means of communication with other worlds, feeling perfectly sure that it will be awarded to me. The money, of course, is a trifling consideration, but for the great historical honor of being the first to achieve this miracle I would be almost willing to give my life.

By most important invention from a practical point of view is a new form of tube with apparatus for its operation. In 1895 I brought out a high potential targetless tube which I operated successfully with potentials up to 4 million valts from 195 to 198. This device was adopted by many imitators

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and with elight modifications it is employed even now in all research laboratories and scientific institutions here and in other countries, and virtually all atomic investigations are carried on with it. At a later period I managed to produce very much higher potentials up to 18 million volts, and then I encountered unsurmountable difficulties which convinced me that it was necessary to invent an entirely different form of tube in order to carry out successfully contain ideas I had conceived. This task I found for more difficult than I had expected, not so much in the construction as in the operation of the tube. For many years I was taffled in my efforts, although I made a stoody slow progress. Finally though, I was remarded with complete success and I produced a tube which it will be hard to improve further. It is of ideal simplicity, not subject to your and can be operated at any potential, horover high, that can be produced. It will corry heavy currents, transform any amount of energy within practical limits, and it possels easy control and regulation of the more. I expect that this invention, when it becomes known, will be universally adopted in preference to other forms of tubes, and that it will be the means of obtaining results undrosmed of before. Among others, it will enable the production of cheap redium substitutes in any desired quantity and will be, in general, immusely more effective in the smaking of

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coing to some obligations I have undersaled no principal size application of the take for instants purposes, I am unable to
make a complete disclosure not. But no soon as I am relieved
of those obligations a technical description of the device una
of all the appointmental will be given to selectifue institutions.

There is one may a discovery which I want to ammounce at this time, consisting of a new matried and apparatus for the obtainment of vacua exceeding many times the highest here of fore realized. I think that as much as one-bill with of a micron can be attained. What may be accomplished by moone of such vacua is a ratter of conjecture, but it is obvious that they will make possible the production of much here interse

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to acting as reflector and a base equipped
tor wires concentric with the tube and at a certain
nee from the inner surface of the rame. In this arrangement
(Iffuse radiation is virtually eliminated, and the heater
if the registor were not present, the rays being
ren the reflector radially to the central or focal
tion escupied by the boiling pot. The principal advantages thus secured are the following: I. A very high efficiency, as much as 96% being attainable. 2. The efficiency is practically the same whether the rot the director of the density of the rays is inversely as more than hal of that in the best heaters of the type referred __ be made to ent almost indefinitely in some cases. Also less wire can bely ed if desired. 5. The heet being largely confined to the range, the kitchen remains comparatively cool. 6. Another practical adventage is greater safety from a variety of accidents frequently occurring with ordinary 7. The new heater is especially adopted for use on shipboard, Pallman cars, serial vehicles and automobiles. on the table, being free from the objections of the present 9. It saves considerable time in certain applications. 10. Owing to simplicity, the cost of manufactoring as low. COLLEGE A CHICETER C FARES Spec Ms Coll Tesla THIS IS A PHOTOCOPY OF ORIGINAL MATERIALS Tesla, Mikola The New Tesla Meetric Heater IN THE COLUMBIA UNIVERSITY L BRARIES. n.p., n.d. e.ms., 3 p. (possibly in Teol.'s hand) The rhoto ippy me the returned to the Riae Book and Manusco at Liberary (80) Bother Liberary) at the With typed copy and carbon. condition o the recerts use. 213705

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- 3. Due to these features the dirroat concention is hardly more than half of that in the best honters of the type IVIOLOGIA.
- 4. The resistor has a relatively much longer life and som be used to last a most indefinitely in some cases. Also less wire can be used if decired.
- 5. The best being largely confined to the range, the kitchen remains
- 6. Another practical identage is greater paraty from a variety of annidents frequently occurring with ordinary ranges.
- 7. The new heater to especially clapted for use on shipboard, Putlman core, serial vehicles and automobiles.
- 8. Libraries it is suitable for all hirds of activity on the teble, being free from the objections of the present type.
 - 9. It saves accorderable time in cortain applications.
 - 10. Owing to simplicity, the cost of manufacturing is low.

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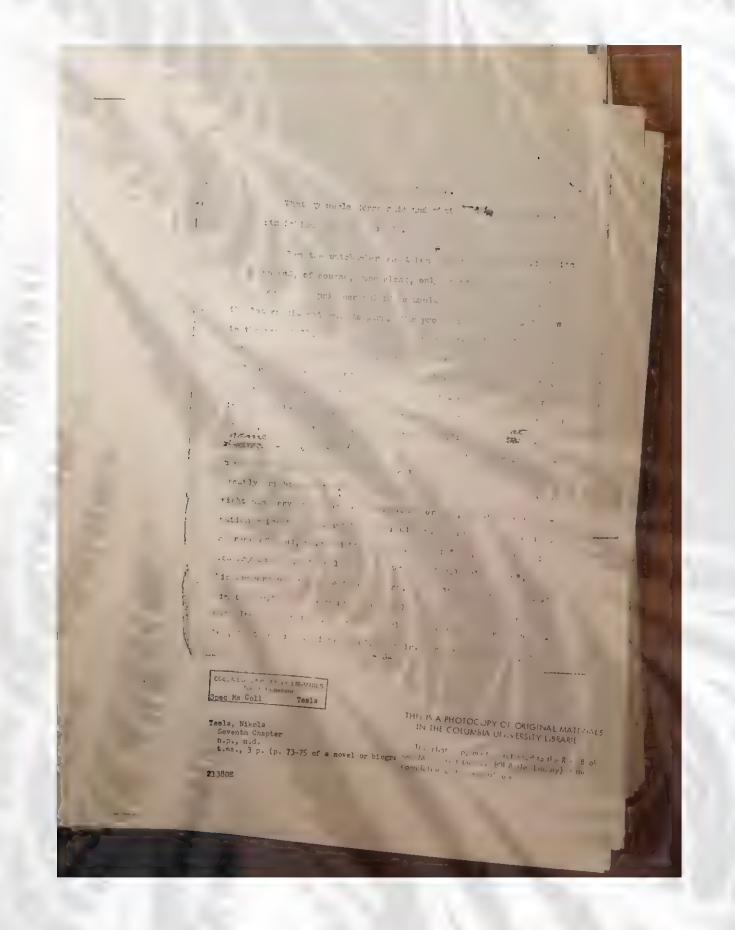
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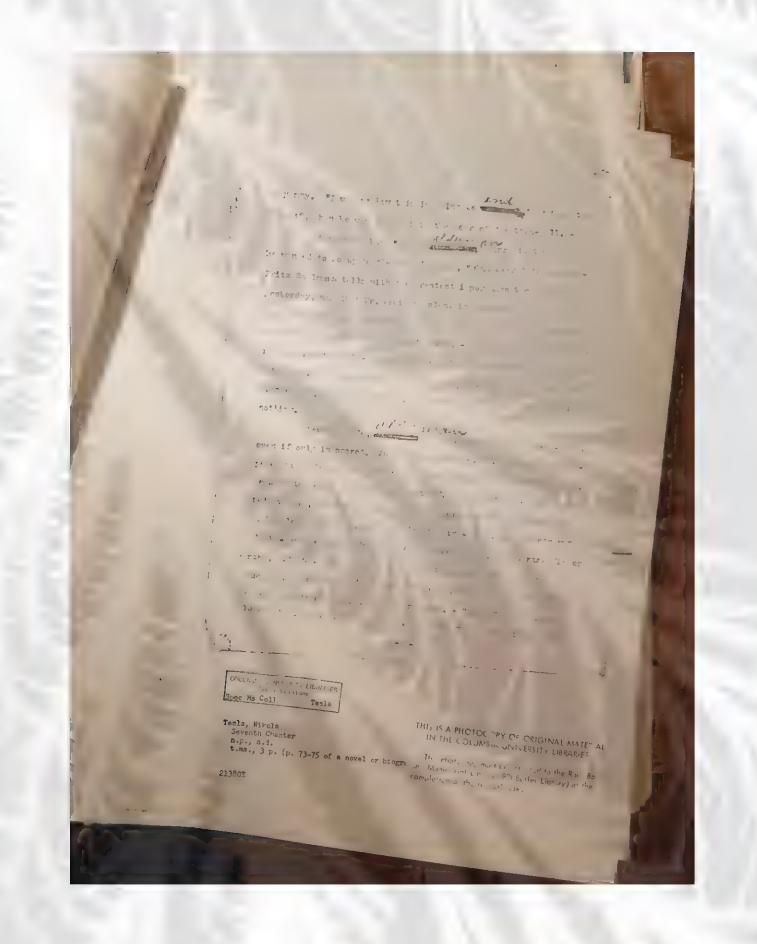
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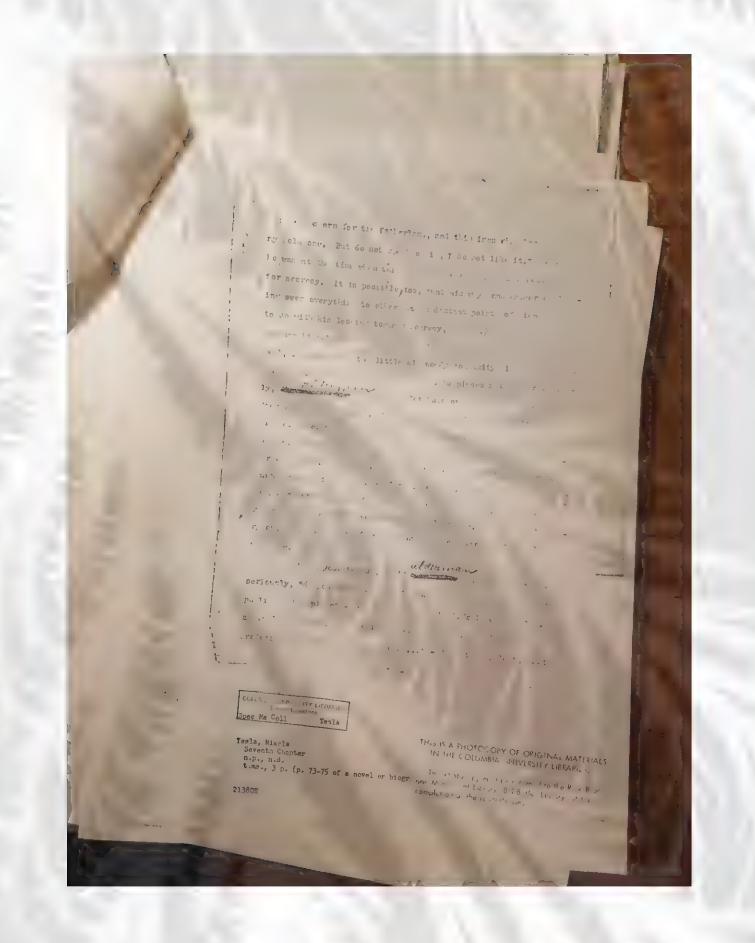
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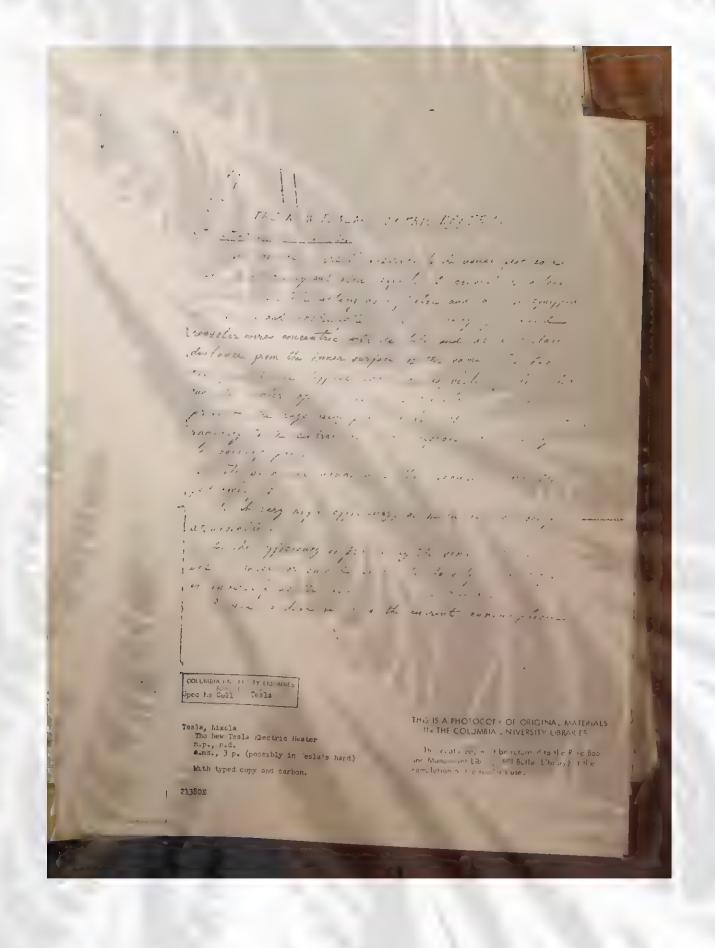
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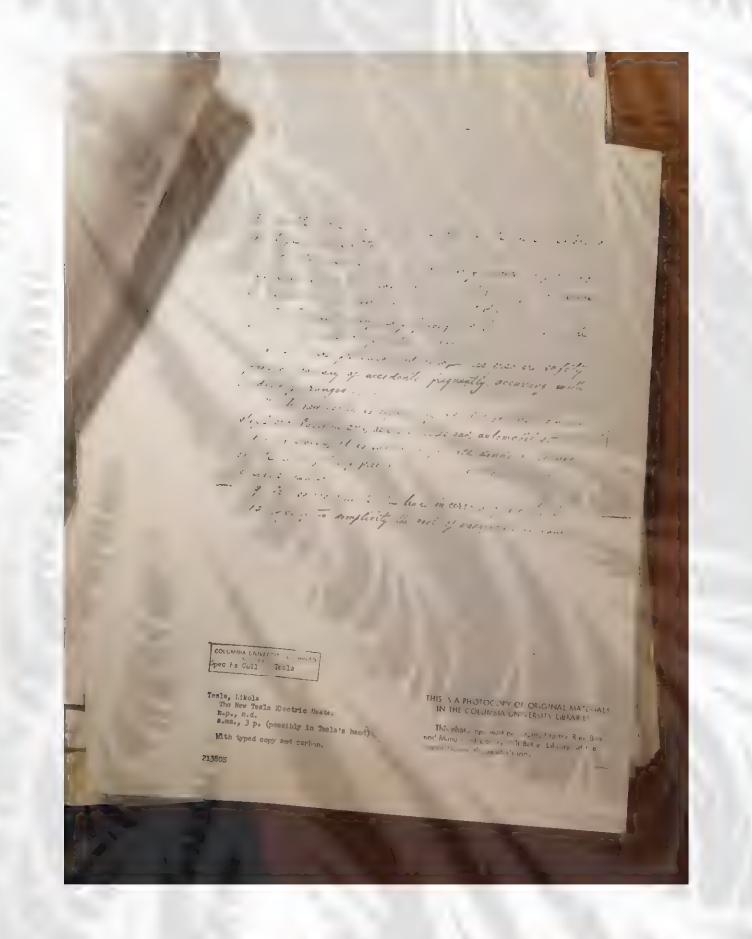
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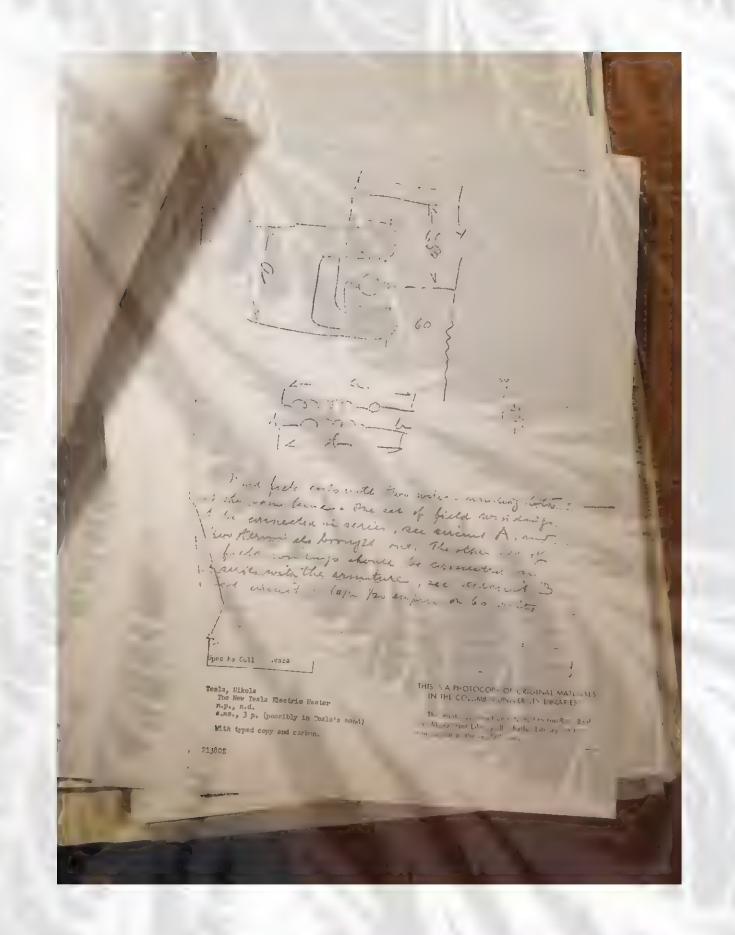


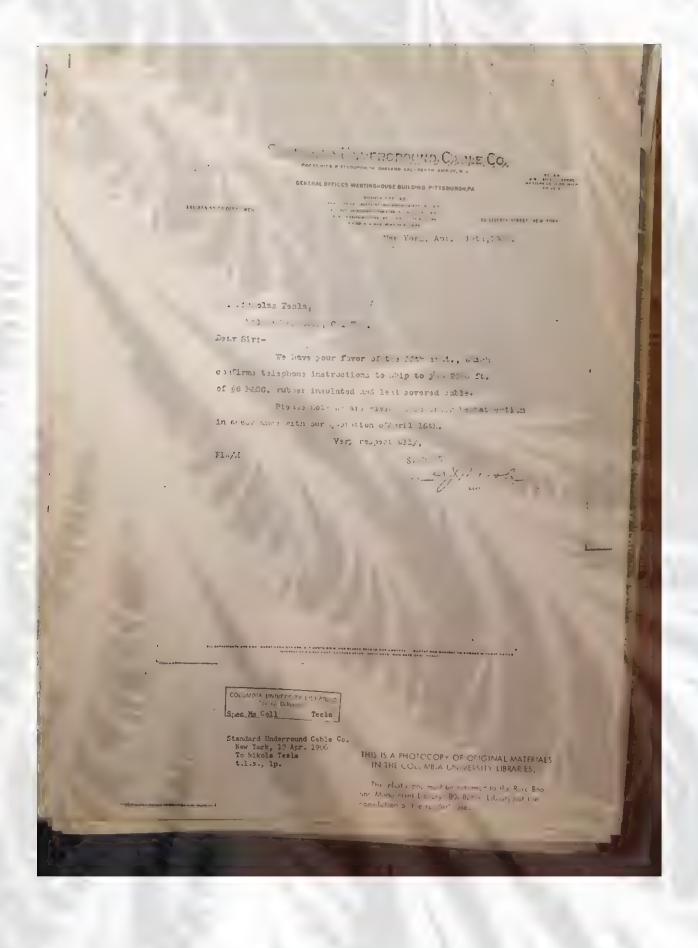


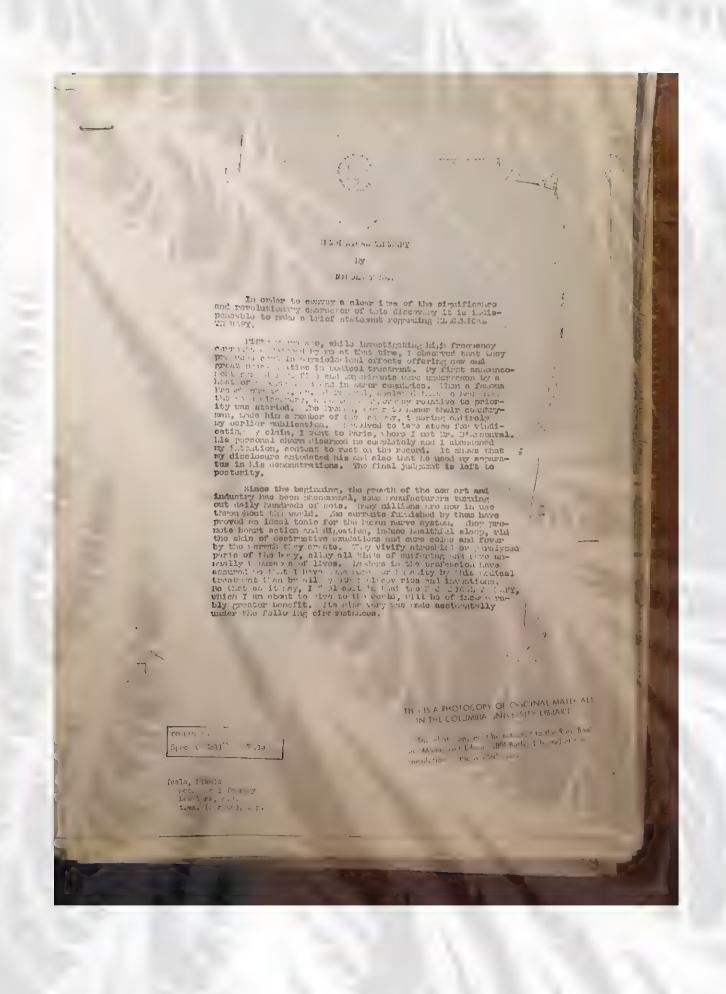


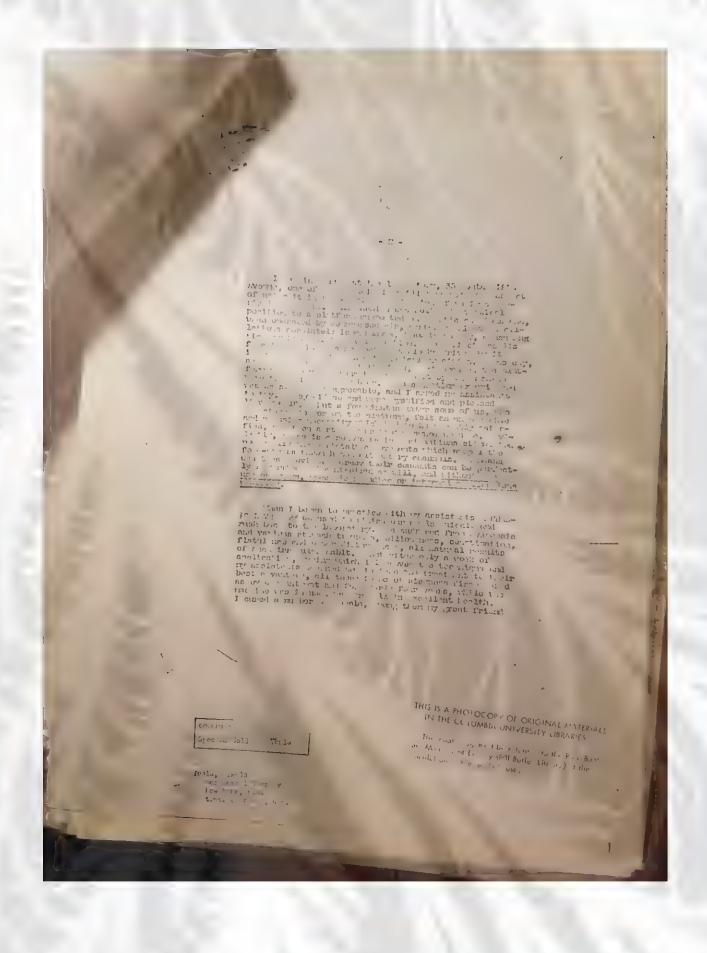












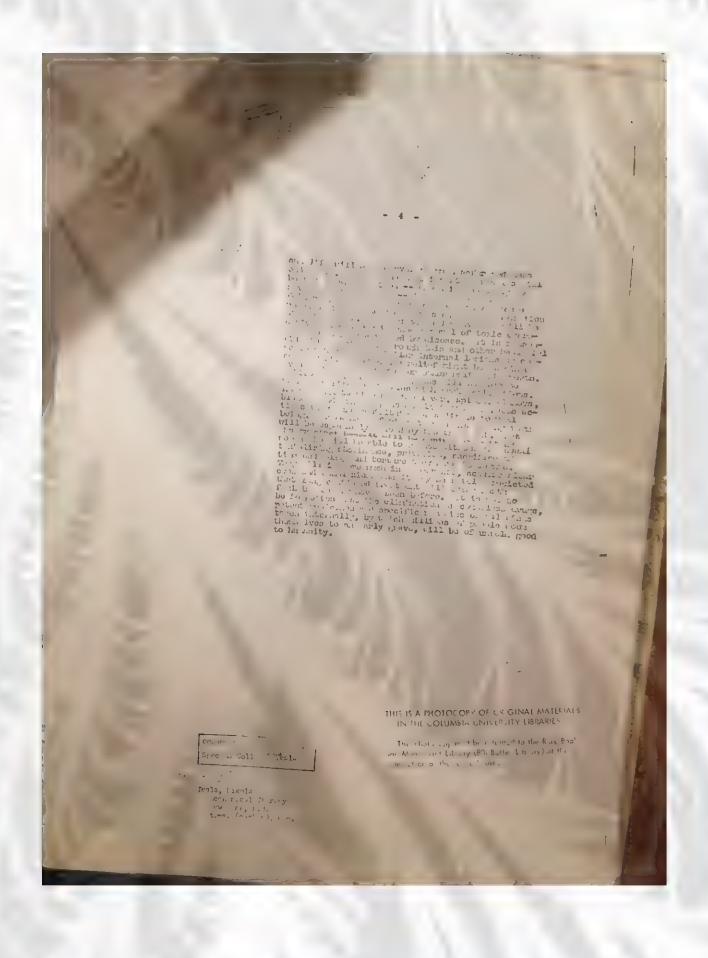
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Terla, ir la



State of New York.

approller's Office.

C. IN THE COMMISSIONER,

New York. Man 7 167

Waldong Kelonia Stolal Bets

Dear Sirs:--I am commissioned by the Comptroller of the State of New York to examine the above named Company relative to taxation.

This matter has been net down for hearing on the day of 190 , at 190 . The President, Secretary or Treasurer, or, in their absence, the New York Manager of the Company, is required to appear for examination at that time. In case of failure to attend and give evidence in this matter, the company will be taxed, on the maximum amount, on information in possession of the department.

Revision of each assessment can be had at the office of this department in Albany, on proper application.

Respectfully yours,

Corporation Tax Commissioner.

Silver of Americania

probable & There

Picer Mail hen Specifications transmiss Jand Lent Eugan Men to Complete both I CABLE SERVICE TO ALL PARTS OF THE WORLD. Pay no Charges to Mescenger unless written in Ink in Delivery Book. Charges La MONEY ORDERS BY TELEGRAPH. HT MESSAGES AT REDUCED RATES.

--: . True Siriel . March 23 1900. - Buck income in a fee labeles, I think They was to to to the kose deside I rem a horror of if such there I would resting for to Heles than to the Elgrin if it was as the prese. whelmed journed article rocking by illustrions griew Sir villian Cooker we a rurary water onto by mise. I inside in the adjustice - trolinguistico " would -do. Juka is william, their is Gileres, itgie. Groves is not distinguished, he es ilustrious colore and sorgoden the leve to ie justicità a j'uprove an joiniste fore. Nes is in med of ihis or near year? Vival lele by prin rice that I expect musely to Tesia.

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Emari.

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and efficient system based on my rotating magnetic field, a discovery which even herd-headed engineers and patent lawyers have declared to be "one of the greatest triumphs of the human mind." To convey an idea of the extent of its most electrical experts, who in his book on the induction most electrical experts, who in his book on the induction world the results of Mr Tesla's work, the wheels of industry would cease to turn, our electric trains and cars would stop, our towns would te dark, our mills dead and idle. So far-reaching is this work that it has become the warp and woof of industry."

Edison and his associates bitterly opposed the introduction of my system, raising a clarer against the "deadliness" of the alternating current, which proved very effective and led to the adoption of a commercial type of machine in the electrocution of criminals, an apparatus machine in the electrocation of originals, an apparatus monstrously unsuitable, for the poor wretches are not dispatched in a merciful manner but literally roasted alive. To the observer their sufferings seem to be of short duration; it must be borne in mind though, that an individual under such colditions, "mile wholly bereft of the consciousand a minute of agony is equivalent to that through all eternity.

Had the Edison companies not finally adopted my invention, they would have been wiped out of existence, and yet not the slightest acknowledgment of my labors has ever

little largery in the rear in the rear investing to resident Hoover's statement, represented the value of electric business, can be trued to dispel incancescent land, my aystem is ere indicated that incancescent land, my aystem is ere indicated that incancescent land, my aystem is ere indicated the little institution of dollars which according to President Hoover's statement, represented the value of electric business, can be trued to my system and its affect on the lighting and other industries. In darkness, Surely, my system is ere important than the incancescent land, which is lat one of the known electric though greatly improved through the best. Aladrences and skill of this has, it is still inefficient for millions of bad hand mental in a still inefficient for millions of bad hand mental in a still inefficient coinion, it will soon be successed by the electrodeless a land than or beauty and sorthers. The technical resources is land than more economical and yielding a light of incofficients of that time were indicquate to make it a prestical success, but most of preise is too much to bestow upon

No amount of praise is too nuch to bestow upon was wrought in and wand russing forms. Whet I contributed constitutes I new and lasting addition to human discurded and forgotten in the continuous evolution of presoners and manifestations of force will live as long as sevence itself.

Nev York, November 5, 1,55.

to 8 West 40th de M. y. C.

New York, Ful. 1 th, 1000.

Rev. Wol our A. Duy rort,

Itulian Mission,

29 Front Str., Drobklyn, M. A.

Auverena Siri-

In repl. to your note to the Cartar, Magraine, which has been forwarded to me through the courtes. Of the Editor, I beg to say that I shall be at your service any time during the day, at m. office, above address.

Yours respectfull;

A. Visita

e ., ..

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That die Erimerung an unsere beginnende Franken, des die ersten unvolkommenen Verende und unverdienten Erolge, Geraelling ihn und Missverstaendnisse neu belebt.

Auf die Brimerung an unsere beginnende Franken und Missverstaendnisse neu belebt.

Auf die Brimerungen, des schnelle Inflichen der Zeit und, eent die Kheinheit der Verwirklichungen welche, welche ins Gebracht die gerufen. Die folgenden Zeilen, welche, were es nicht wegen Ihrer Anwegung, vielleicht eine lange Zeit der Oeffentlichtkeit noch nicht uebergeben worden waeren, sind ein Anerbieten in der freundlichen Stimmung von Alters her, und meine besten Juensche auf Ihren zukuenftigen Erfolg begleiten sie.

Gegen Inde des Jahres 1898 fuehrte mich eine systematische Porschung, der ich seit Jahren obgelegen hatte in der Absicht
eine Methode elektrischer Energieusbertragung durch das natuerliche
Medium zu vervollkommen, zu der Erkenntnis drei wichtiger Erfordernisse: erstens, die Entwickelung eines Senders von grosser Kraft;
zweitens, die Vervollkommung von Mitveln zur Individualisierung
und Absondering der Gesetze der Portpflanzung von Stromen durch die Erde

DIE UEDEMTRAGUNG LIKTI ISCHE TUIRCIE CHED DUAIT.

a Maiola Pesla.

ciner le destable. The Brief has die Trimmerung an unsere beginnende Freundschaft, am die ersten unvollkommenen Verende und unverdienten Erfolge, detaellige ich und Missverstaendnisse neu belebt. Trimet die Groesse frucher Erwar ungen, des schnelle Inflichen der Zeit und, eent die all inheit der Versirklichungen welche, welche ins Gedaschtnis gerufen. Die folgenden Zeilen, welche, were eenfeht wegen ihrer Angegung, vielleicht eine lange Zeit der Oeffent-lichtkeit noch nicht webergeben worden weren, sind ein Anerbieten in der freundlichen Stimung von Alters her, und meine besten Zuensche auf Ihren zukuenstigen Erfolg begleiten sie.

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und Absenderung der Gebetze der Fortpflanzung von Stroemen durch die Brde
stellung der Gebetze der Fortpflanzung von Stroemen durch die Brde

und die Atmospheere. Vorschiedene Grunde, von denen nicht der comingste ate mir von meinem Freunde Leonard E. Jurtis und der Co-1 : 2 ings Electric Company engelotene wilfe war, bewogen wich, fuor meine experimentellen Unters chungen das grosse Pluteau, zwei tausend Meter weber der Met esflacche, in der Nache dieses reizenden Kurortes zu wuelden, welchen ich spaet im Mei 1899 errsichte. Kaum war ich erre e wart gewesen, als ich mich schon zu der glacklichen Wahl erenalieren konnte, und ich begann die Aufgabe, fuer welche ich zuch lunge geschult hatte, mit dankbaren Sinne und voll begeisternder Hoffnung. Die vollkommene Reinheit der Luft, die unvergleichliche Schoenheit des Kimmels, der erhabene Anblick einer hohen Gebirgskette - alles rune umher trug dazu bei, die Beding angen fuer wissenschaftliche Beobach ungen ideal zu machen. Daze kam noch der belebence Einfluss eines herrlichen Klimas und eine eigenartige Verschaerfung der Sinne. Die Organe unterziehen sich in jenen Regionen merklichen physikalischen Veraenderungen. Die Augen nehmen wine ausserordentliche Klacheit an, was die Sehbraft verbessert; die Ohren trocknen aus und werden empfindlicher Bogen Schall. Man kann dort Gegenstaende auf soch grosse Entfernungen unterscheiden, dass ich vorziehe, dise von jemand anders neanch zu lassen, und ich habe - dies kurn ich zu bezeugen wagen sieben und acht hundert Kilometer weit entfernte Donnerschlaege gehoert. Ich hastte sie auf noch groessere Entfernungen hoeren Kocnnen, venn es nicht langweilig gewesen warre, die Ankunft der Laute,

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of it loom introduct of dublicoming told litter s and the contract multiples and only puls not a la contract de la la cavorsial i junt los dem Strulfion don macht andn am. al essaut arrain war, wurde caroli das und Duennheit der Luft traegt dazu bei, dass das Toster wie in einen Mossel verdampft, und statische Elektricitaet en mickelt sich in grosser Henge. Elitzentladungen sind demgemaess sehr Haeufig und mitunter von unb preifliche Hartigkeit. Bei einer G legerhait funden in zwei Stunden annachernd zwoelf tuusen. Entladungen statt, und alle in einem Radius von gewiss weniger als francai; Milometer you Luboratorium. Viele darsalban gulchen riesannafton Decumen aus Feuer mit den Stasmmen nach oben oder unten. Mugelblitze habe ich nicht gesehen, aber als Belohnun; füer meine Unttaeusehung gelang as mir spacter, die Art ihrer Bilung zu bestillen und sie ku nstlich zu erzeugen.

Am Ende desselben Honats bemerkte ich monrere Hale, dass meine Knetramente durch Entladungen, die in grosser Entlemung staatfunden, staetkor beeinflusst wurden, als durch solche in der Edehe. Die war fuer mich ein grosses End sol. Was war die Urcaene? Eine Folke von Beubachtin in bein is, dass os nicht von den Uniterstäten in der in ensenti mit i samt in inne inen in Abdon-

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als ich den ersten auscheidenden, experimentallen Beweis einer Wahrheit von usbermeltig nder Wichtigkeit fuer den Fortschritt der Menschneit ernicht. Eine dunkle, stark geladene Wolkenhause sammelte sich im I sten. Gesen Abend brach ein heftiges Gewitter los, welches, nachden es einen betrachtlichen Teil seiner Gewelt in den Bergen von sich geseben hatte, mit posser Geschwindigkeit under die Ebene dahingejagt wurde. Dieke und lang anhaltende Bogen bildeten sich in fast regelmbeseigen Zwischenraeumen. Meine Beobachtungen waren nun sehr erleichtert, und die sehen gewonnenen Erfahtungen machten sie genouer. Ich war imstande, weine Instrumente das wellt der int den der Registrier-

opparat t win aj lutiert war, wurden sein. Ansolle e 110 del 24nehmenten in ferming des Cewitters schwaecher und des wrecher, dis . Ich beobachtete in be i ... Ir Irrarum; Und wirklich, nach einer Eleinen Teile fingen die Anschlast Wieder ali, ali sa la la companio de la companio de com <u>l'adman</u> de-wieder auf. Viele Hale wiederholt n sich dieselben Wirkungen in regelmaessig whederkenromen Zwischenraeumen bis der Sturm, der, wie einfach. Berechnungen erwiesen, sich mit fast gleichmaessiger Geselwingigeit bewegte, sich auf eine Entfernung von etwa dreihundert Kilometer zumwelkgezogen land. Und auch dann liessen diese selts men Wirkingen noon might bach, sondern fuhren fort, sich mit unverminderner Staerke zu offenbaren. Spaeser wurden aehnliche Beobachtungen auch von ud inda Admistanten, larra Fritz Loemenstein, genacht, und hurz nachher Loten sich mehrere vortreffliche Gelegenheiten dar, die das wirkliche Wesen des winderbaren Phaenomens noch kraeftiger und unverkembar an den Tag brachten. Es blieb kein Imeifel: Ish beobachtete stehende Wellen.

Indem die Quelle der Stoerungen sich fortbewegte, kam der Munfachgerstromkreis nacheinander auf ihre Knoten- und Bauchpunkte. So unmoerlich es auch schien, vernicht sich dieser planet, trotz seines gevalligen Unfunges, wie ein Leiter von beschraenkten Dimensionen. Die ungehe re Bauk trutt closer Dusache für die Vebertraffic von Paer ein den beim auf zur Bakun gund klur gewor-

an, the letter of the content of more than the content of the cont

Mir class needs allown Medichketten in Aussicht, mit dem exaciment lich process vor der, dass ihre Verwirklichung von num an num and Toure won Facility has, Geduld und Geschichlichkeit war, nahm ich die Entwickelung meines Sendemultiplilators kraeftig in Angriff, jetzt cook aloat so sehr mit der urspruenglichen Abstolit, comen solo...n v n grosser Mant zu erzeigen, sondern wielmehr zu den Zwecke, den besten konstruieren zu lernen. Dies ist im Wesentlichen ein Strombreis sehr hoher Selbstinduktion und geringen Wilerstandes, den man wol einem typischen, in der Telfur-Thie mit Mertatachen oder elektroma medischen Wellen benutaten Strummeise als gerade entergongesetzt bezeichnen konn. Is ist schwor, sich von der nunderbar a Kraft dieser eigenantigen Vorrichtung inen Be-Wiff au nachen. Di die elektro ... netischen Strukkungen auf eine unbedoutende Quantitaet herabgesetzt un. richtige Rezen.nzverhoeltmisse a Theolit whileton winden, wirkt der Stronkreis vic ein ungehouses Penu dum, indea er dir poi dece 7 - oriv. Is - mabe rongt ager i elera val de Arce val ille litt e a Alexagia era Aciolto. It machine the Schrim ingen and the to interest action, it is to the control of the control

tol dem Individualisierung und Absonderung der Indija della blich ver espert. Gresse Tipari L. t. d. ra. unise: Aru it beijemessen, demm es fand sich, dass einfaches Abstillen nicht hinreichte, un dem strengen praktischen Erfordernissen gerebut 2 werden. Die fundamentale Idee, zum Zwoke der Absoncer alt der lebestragenen Maergie eine Anzahl absonderlicher, koperativ vereinigter Elemente anzuwenden, fachre ich direkt auf meine Lekthere von Spenderes klurer und anregunder Ausle, ing des mirstellichen Mervennechunismus zurweck. Welchen Einfluss at Jes Prinzip auf die Uebertragung von Intelligem und elektrischer Energie im Allgemeinen haben wird, kann jetzt noch nicht abgeschaetzt werden, denn die Kunst ist noch im Keimzustande; aber die gleichzeitige Vebermittelung von tausenden von telegraphischen oder telephonischen Botschaften durch einen einzigen Leitrungskanal, sai er natu-rhich oder au nethich, ohne grandriche greenseitige Stoeming, ist gouiss tunlich, maehrem millionen mossligh sind. Andererseits kann durch Ammendung einer jet Rooperativer Elemente und will kuerliche Abzenderung ihre Losonderlichen Figensehaften und ihrer Reihem. Lee munn ein beliebi pr Grad der Indicit delisierang erreicht vorden. Aus degenscheinliel n de naen wirt. Moses Prinzip auch fant die Dreiterung der U energangsen formang van Teat solo.

Der Fortschriet, obgleich no wittlichtes lin sen, war bis denlit und sieher, dem die Zielt, nach dien ich siebte, war von in der Richtune meiner fortwal randen Studien und Thetilkeit. In ist deshilb kann Aufgleic beendete und die Resultate erreichte, welche ich in meinem Arthel im Contary Majusine vom Juni, 1900, in dem jodes Wort sorgfaeltig gewogen brae, anzeigte.

Gebrauch zur Verfuegung zu stellen, sowol zur Verenterung von Energie in kleinen Quantitueten fuer skriftische Zwecke, als auch auf industriellem Manssstabe. Die von mir erzielten Resultate haben meinen Plan der Intelligenzuebermittelung; fuer welche der Kame "Welttelegraphie" vorgeschlagen worden ist, leicht ausfuelrbar gemacht. Das Prinzip ihrer Wirkung, die angewendten Mittel und ihre Anwendungsfachigkeiten bilden, glaube ich, eine radikale und fruchtbare Abweichung von den, was vorher getan worden ist. Ich habe keinen Zweifel, dass sie sich fuer die Aufklaerung der Massen, besonders in noch undivilisierten Taendern und schwer zugaen Michen Regionen, sehr wirksem erweisen, und dass sie zur allgemeinen Sicherheit, Bequenlichkeit und Wolsein, und der Aufrechterhaltung friedlicher Verhaeltnisse wesentlich beitragen wird. Sie bedingt die Anwingen eine Arzahl von Anlagen, wiehe alle imstande sind,

s nice. I be also bleet and a new consider of Grenzen der Erac zu in nice. I be also bleet and verzugswisse in der Mache eines wichtlich in Dividioutionophist is placent sing, has de Mache eines wichtlich sit worden beit der Mile geoffent, werden nach allen Punkten der Erac geoffent. Mineyperittle und ein den Wortelland, vorrichtung, die men in der Tosche togen komnte, kann dem ingendus auf See ader Lore aufgestellt verlen, du wird die Meuigkeiten der Welt, oder solche spezielle Depeschen, die führ sie bestimt sind, verzeichnen. Auf diese Weise wird die genze Erde so zu segen in ein riesiges Gehirn verandelt werden, welches instande ist, in jedem Teile die Mitteilungen aufzundimen. De eine einzige Anlage von nach hund at Die destachten hund at Millionen von Instrumenten betactigen kunn, wurd das System ein tatsaechlich unbegrenztes Arbeitsvernoegen haben, und muss notwendigerweise die Webermittellung von Intelligenz ungeheuer erleichtern und billiger machen.

Die erste dieser Gentrelanlagen waere schon beendet, wenn sich nicht unvorhergeschene Verzoegerungen eingestellt haetten, die jedoch gluechlicherweise nichts mit dem rein technischen Charakter zu tun haben. Aber dieser Zeitverlust, obgleich verdrieselich, duertte sich schliebslich dech als ein Segen in Verkleidung erweisen. Die beste mir bekannte Konstruktion ist gewachtt worden, und der Sender wird einen Wellenkomplex von einer gesauten unximplen Aktivitaet von zehn Millionen Pferdestaerken, von welcher ein Procent seichlich i der ist, "die Tarkurch au umgwert m", von sich welch. Der Fill in dieser ungebe von Frergledogabe, finz zweimel so

1 ale south a Millian paintel , sun nar eiren Amera na com a com a com a com a march and a la company of the co

From habe, habe ich der edlen Grosmut Herrn J. Pierpont Morgan's the vordanken, die mi so willkommener und ermutigender war, weil sie mi einer Zeit gemicht wirde als liefenien, die seitdem am meisten verspromin haben, die glosssten Zweifler waren. Auch melnen Fround Stanford The eines ich für miele un igenmuetzige und wertvelle Milfe diech. Diese Argen ist nin welt forgeschriften, und wenn auch die Resultage verspretet sind, wirden sie doch sieher koten.

Die Webertra jing von The vice auf industriellem Masstabe vira Little weile micht vernachlaessigt. Die Canadian Magara Power Company hat dir ein vorzaellichts Angebet gelacht, und eine fast eben so grosse Genugtung als des Erringen von Erfolg der Kurst halber wird es mir verschaffen, ihre Konzession füer sie finanziell vorteilhaft an athen. In diest erst au Maftanlage, mit deren Inturf ich seit langer Zeit beschaeftigt bin, beabsichtige ich, wehn i asond Pfordelmasfie un er ein a Spannun; von hundert Millionen Volt, die ich j for die Sich auch erzeigen und Enchaben kann, zu worteil n.

Diese Energie wir er all . I der Ende gesammelt werden, war word so in kleinen Quantitacten, vin einem Bruchteil einer bis

is the state of the same and the state and - .mc: - sa. Dan Stin. Ts 🖘 A control of n, more than a, one in 1 1 : Full . And of the control of the destruction of the control of . The contract of the second second of the contract of the con Applies of in. Distriction was able missilian elected sein, of the alabel to the transfer of the angle and accident graza die michtips I. I day, h. M. T. T. Tree I. Minisale Zeif defaupriecon is the automa in find solo was sometalish popular wordin. . o will also much access We manage on Liller Arton, die entweder jetzt in. Gobrash cincock tyells fort word in he maen, ind indem ich sie out it or Works in Director bette, as the ist. Instance sein, all tine . Anla . von mine, well, als zelt, this at Pf reconcertion der placed will dide to one to one themselfue, but diction. Die Dinfuchrung dieses S, s ems wird G legenh iten gow which fact I. . na m; and Fabrikation, de sit sich noch ni work - dur recoten haben.

Du joh der weitreichenden Wiedlickeit dieses ersten Versuchs und dessen Findlussiant zukwenftigt Antwickelung gewärtig bin, werde ich langsam und songtwellig zu Worze gehen. Erfahrung ha wich gelehrt für Unternehmungen, die nicht gaenzlich von meinnen eigenen Taenlickeiten und Answen ungen abhaen zen, einen Termin füs zuse zen. Abe ich Wildelich Hoffent, dass einse grossen Verzuwalleh aum nicht wie entwicht ond, wa ich weise dass, wenn eines so die Wildelich und nicht wie entwicht ond, wa ich weise dass, wenn eines so der Willen und dass die der Gewissheit

When wie Course, Eufaellin enthuellte una emperia ntell lest norms i dans it welling comment wird, dass ai or planet, bei in a 1 the ersolved enden Union sold involved, the felt is looke Strucne tatsweeklich nichts welf ist als eine klein. Netallhagel und dras involge diese Tatsache die Verminaliehung wieler Mesplichkeiten, von denen jede der Einbilaunrekraft spottet und von unberschenbarer Bedertun ist, absolut siene: meht; wenn die erste Anlage in Betrieb gese at und bewiesen wird, dass eine telegraphische Botschaft, fact so generm und unsteerbar wie ein Gedonke, auf irgend cin. irdische Indenning webertrag n worden, dass der Schall der men schlichen Stim e, mit allen ihren Inconationen und Modulationen, gotreu und augenblicklich an argena einer andern Stelle der Erde wieder erzougt worden, dass als Inergia sinus Unoscribilles pur Lieferun von Licht, Waerme and Triebkraft, ingenduo - auf See, oder Land oder hoch oben in der Luft - verwendbur genacht werden kunn. dam wird die Menschheit sein wie ein Ameisenhaufe, den man mit einem Stock aufg rushrt hat: Schet die Aufregun; die da kommt!

MY INVENTIONS

by Mileola Ceals.

VI. The Art of Telautomatica.

How Posls 's Mind Recuperates. No subject to which I have ever devoted myself has called for such concentration of mind and strained to so dangerous a degree the finest fibers of my brain as the system of which the Magnifying Transmitter is toe foundation. I put all the intensity and vigor of youth in the development of the rotating field discoveries, but those early labors were . of a different character. Although strenuous in the extreme, they did not involve that keen and exhausting discernment which had to be exercised in attacking the many puzzling problems of the wireless. Despite my rare physical enduence at that period the abused merves finally rebelled and I suffered a complete collapse, just as the consummation of the long and difficult task was almost in sight. Without doubt I would have paid a greater penalty later, and very likely my career would have been prematurely terminated, had not providence equipped me with a safety device, which has seemed to improve with advancing years and unfailingly comes into play when my forces ere at an end. So long as it operates I im safe from danger, due to overwork, which threatens other inventors and, incidentally, I need no vocations

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comply to see the second proper. And I am all out read to see the second proper to the second proper to the second proper to the second proceeding I all out to the second proceeding I attempt to continue the second proper to the second proper to the second proceeding I attempt to continue the second proceeding that the second proceeding that the second proceeding the second proceeding the second proceeding that the second proceeding the second procedure of the secon

In this connection I will toll of an extraordinary experience which may be of interest to students of psychology. I had produced a striking phenomenon with my grounced transmitter and was embedded to escertain its true significance in relation to the currents propagated through the earth. It seemed a hopeless undertaking and for more than a year I worked unremittingly but in vain. This profound study so entirely absorbed me that I became forg thul of everything else, even of my undermined health. It last, as I was at the point of breaking down, nature sachied the preservative inducing lathel sleep. Regaining by censes, I realized vita constantation that I was

unable to malme somme from my life except those or in ener. the vary first ones that not entered my consciousness. Curiously enough, these appearso before my vision with startling distinctness the afterded to selecte relief. Hight siter nivet, when retiring, I would think of them and more and more of my previous existence was reverted. The image of my mother was olveys the principal figure in the spectacle that slowly unrolled ,and a con-Buming desire to see her again gradually took possession of me. This feeling grew so strong that I resolved to drop all work and satisfy my longing. Out I found it too hard to break ever from the laboratory and several months elapsed during which I had succasded in reviving all the impressions of my past life up to the spring of 1892. In the next picture that came out of the mist of oblivion, I saw myself at the Hotel de la Paix in Paris just coming to from one of my peculiar sleeping spells, which had been caused by prolonged exertion of the brain. Imagine the pain and distress I felt when it flashed upon my mind that a dispatch was handed to me at that very moment beering the sad news that my mother was dying; I remembered how I made the long journey home without an hour of rest and how she rassed away efter weeks of egony! It was especially remarkable that during all this period of partially obliterated memory I was fully alive to everything touching on the subject of my research. I could recall the smallest details and the least insignificant observations in my experiments and even recit; pages of text and complex methematical formulae.

b li is film in a law of compensation. The im proportion to the labor and sacrific a race. . i .. .9 of the reasons why I feel certain prove mo to the terms fenerations. I on prompted - Lation not so much by thoughts of the commercial strial revolution which it will surely bring about, but of the humanitarian consequences of the many achievements it makes possible. Considerations of mere utility weigh little in the belance against the higher benefits of civilization. We are confronted with portentous problems which can not be solved just by providing for our meterial existence, however abundantly. On the contrary, progress in tals direction is fraught with hazards and perils not less menacing than those born from want and suffering. If we were to release the energy of stems or discover some other way of daveloping cheap and unlimited power at eny point of the globe this accomplishment, instead of being a blessing, might bring disaster to mankind in giving rise to dissension and enerchy which would ultimately result in the enthronement of the hated regime of force. The greatest good will come from technical improvements tanding to unification and harmon; and my wireless transmitter is preëminently such. By its means the human voice and likeness will be reproduced everymaero and factories

driven thousands of the from weterfulls furnishing the power:

a time propelled around the earth without a

controlled to create lakes and rivers

for a transformation of arid deserts into

cartile action for telegraphic, telephonic and

cimilar uses a treally cut out the statics and all

other internation of the wireless. This is a timely topic on

which a few words might not be smiss.

Dering the past decade a number of people have errogantly claimed that they had succeeded in doing away with this impediment. I have carefully examined all of the arrangements described and tested most of them long before they were publicly disclosed, but the finding was uniformly negative. A recent official statement from the U. S. Nevy may, perhaps, have taught some beguilable news editors how to appraise these announcements at their real worth. As a rule the attempts are based on theories so fallscious that whenever they come to my notice I can not nelp thinking in a lighter vein. Quite recently a new discovery was heralded, with a desfening flourish of trunpets, but it proved another case of a mountain bringing forth a mouse. This reminds me of an exciting incident which took place years ago when I was conducting my experiments with currents of high frequency. Stave Brodie had just jumped off the Brooklyn Bridge. The fest has been vulgarized since by imitators, but the

t. : 1 : ing printor. On a bot المناع المنافل المنافل المنافع which gare no an activity obtains for the coreless remark: "This is what I said when I jumped off the bridge". Ho sconer had I uttered these words than I folt like the companion of Timotheus in the voem of Schiller. In an instant the re was e pandemonium and a dozen volues cried: "It is Brodie!" I threw a quarter on the counter and bolted for the door but the crowd was at my heels with yells: "Stop, Staye!" which must have been misunderstood for many persons tried to hold me up as I ran frantically for ty haven of rotage. By dorting around corners I fortunately measured - through the nedlem of the fire-escape - to reach the isporatory, which I tarsw off my coat, camouflaged mysolf as a sard working blacksmith, and started the forge. But these precautions proved unnecessary; I had eluded my pursuers. For many years afterward, at night, when imagination turns into practices the trifling troubles of the day, I often thought, as I to wed on the bed, what my fate would have been had that mob caught no and found out that I men not Stave Erodia:

Now the engineer, and lately gave an account before a tochnical body of a novel remeny against statics based on a "herotofore unknown law of Leture", seems to have been as recomes as tyself when no contended that these disturbances propagate up and dom, unils those of a transmitter proceed along the earth. It would mean that a condenser, as this globe, with its ga. . . onvelop, couls be charged and discharged in a ser quite contrary to the fundamental teachings propounded in every elemental text-book of physics. Suca a supposition mould have been condemned as errorecus, even in Franklin's time, for the facts bearing on this were then well-known and the identity between atmospheric electricity and that savelened by machines was fully established. Cbviously, natural and artificial disturbances propagate through the carth and the air in exactly the same way, and both set up electro-motive forces in the norizontal, as well as vertical, gence. Interference can not be craincas by any such methods as were proposed. The truth is this: In the sir the potential increases at the rate of about fifty volts per foct of eleration, owing to which there may be a difference of pressure smounting to twenty, or even forty thousand volta between the unper and lower ends of the autenna. The masses of the charged atmosphere are constantly in motion and give up electricity to the conductor, not continuously but rather disruptively, this producing a princing noise in a consitive telephonic

bu 'conditated it is purely local and has
little to the form of apparatus comprised four
ntennes. These one corefully calibrated to the same frequency and connected in multiple with the object of magnifying the action, in receiving from any direction. When I degired to ascertain the crigin of the transmitted impulses,
oach diagonally actuated pair was put in series with a primary coil energizing the detector circuit. In the former
case the sound was loud in the telephone; in the latter it
cassed, as expected, the two antennes neutralizing each other,
but the true statics manifested themselves in both instances
and I had to device special preventives orbodying different principle

By employing receivers diffracted to two points of the ground, as aggested by malengago, this trouble caused by the charged sir, which is very serious in the structures as now built, is mullified and besides, the liability of all kinds of interference is reduced to about one-half, because of the directional character of the circuit. This was perfectly self-evident, but came as a revelation to some simple-minded wireless folks whose experience was confined to forms of apparatus that could have been improved with an axe, and they have been directing of the lear's skin before

Filling on a. If it have true that strays purformed such antics, it would be easy to jet rid of them by receiving without sarials. But, so a native of fact, a wire buried in the ground which, conforming to this view, should be accolutely immune, is more susceptible to certain extraneous impulses then one placed vertically in the sir. To state it fairly, a slight progress has been made, but not by virtue of any perticular method or device. It was achieved simply by discarding the enormous structures, which are had enough for transmission but wholly unguitable for reception, and adopting a more appropriate type of receiver. As I pointed out in a previous article, to dispose of this difficulty for good, a radical change must be rade in the system, and the cooner this is done the better.

Redio Covernment Control Not Wested.

It would be calamitous, indeed, if at this time when the art is in its injecty and the vest majority, not excepting even experts, have no conception of its ultimate possibilities, a measure would be rushed through the legislature making it a Government monopoly.

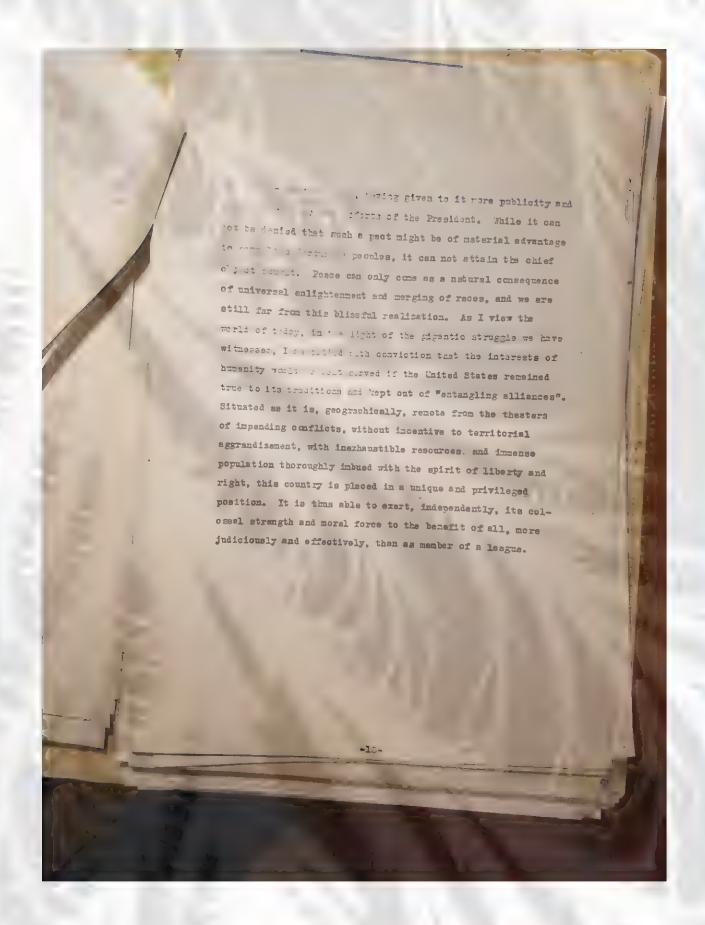
This was proposed a few weeks ago by Secretary Daniels, and no donot that distinguished official has made his abject to the Sanate and House of Representatives with sincere conviction. But universal evidence unmistakably shows that the best results are always obtained in healthful commercial competition. There are, however, exceptional reacons why a should be given the fullest freedom of

development. In the direct place it office prospects immeasuredly grewher and note v tal to betterment of human life than any other invention or discovery in the history of man. Then again, it must be maisrate d to t t monverful art ame been, in its entirety, evolved here and c n be called "American" with more right and propriety them the tolernose, the incondescent lemp or the heroplane. Enterprising gain ergs at linesecond on any eval of minimies and the control of a periodical was too Colontific American accords the chief credit to a foreign country. The Germans, of con me, gave us no Hertz-saves and the Eussian, Inglish, French and Italian exper vero quick in using them for signalling purposes. It were the children the the new agent and accomplished with the old classical and unimproved induction coil-scarcely anything more than another kind of heliography. The radius of transmission was very limited, the results attained of little value, and the Hertz oscillations, as a means for conveying intelligence, coul: have been savantageously replaced by sound-waves, which I savocated in 1891. Moreover, all these attempts were made three years after the basis principles of the wireless ageten, which is universally employed today, and its potent instrumentalities had been clearly described and devaloped in America. No trace of those Hertzian appliances and methods remeins today. We have proceeded in the vory, opposite direction and what has been done is the product of the bruins and efforts of citizens of this country. The fundamental patents have expired and the opportun-Ities are open to all. The chief argument of the Sacretary is based on interference. According to his statement reported in the New York Herald of July 29th, signals from a powerful station can be intertested in every village of the world. In view of this fact, waich was demonstrated in my experients of 1900, it would be of little

int. I may remain that only recently an odd looking and a led on me with the object of enlisting my so the natruction of world transmitters in some distant land. We have no money, he said, but carloads of solid soli and we will sive you a liberal amount. I told him that I wanted to see the what will be done with my inventions in America to the ended the interview. But I am satisfied that some dark forces are at work, and as time goes on the maintenance of continuous communication will be rendered more difficult. The only remedy is a system immune against interruption. It has been perfected, it exists, and all that is necessary is to put it in operation.

The terrible conflict is still uppermost in the minds and perhaps the greatest importance will be attached to the Magnifying Transmitter as a machine for attack and defense, more particularly in connection with teleutomatics. This invention is a logical outcome of observations begun in my boyhood and continued throughout my life. When the first results were published, the Electrical Review stated editorially that it would become one of the most potent factors in the advance and civilization of mankind. The time is not distant when this prediction will be fulfilled. In 1898 and 1900 it was offered to the Government and might have been adopted were I

one of those who would go to Alexander's shepherd when they want . Smetaing from Alexander. At that time I really thought tiveness. and elimination of the personal element of combat. Em and a lost faith in its potentialities, my viewe have changed since. War can not be avoided until the physical cause for its recurred as record and tois, in the last enelysis, is the vest ent at of the planet on which we live. Only through annihilation of distance in every respect as, the convegance of intelligence, transport of passengers and supplies and transmission of exergy will conditions be brought about some cay, insuring permanency of friendly relations. What we now want nost is closer contact and better understanding between individuals and communities all over the earth, and the elimination of that fanatic devotion to exalted ideals of national egoism and pride which is always prone to plunge the world into primeval barbarism and strife. No League or parliamentary act of any kind will ever prevent such a calsmity. These are only new devices for putting the weak at the mercy of the strong. I have expressed myself in this regard fourteen years ago when a combination of few leading governments - a sort of Holy Alliance - was advocated by the late Andrew Carnegie, who may be fairly considered as -12-



trese prograpaical aretenas, publianeu in the Mactrical Dr. situator, I have that on the circumstances of my early life and sold of an affiliation which compelies me to unremitting exercise of imagination and self-observation. This mental activity, at first involuntary under the pressure of illness and suffering, groundly became second nature aim led me finally to recognize that I was but an automaton devoid of free will in thought and action and merely responsive to the forces of the environment. Our bodies are of such complexity of structure, the motions we perform are so numerous and involved, and the external impressions on our sense organs to such a degree delicate and elusive that it is hard for the average person to grasp this fact. And yet nothing is more convincing to the trained investigator than the machanistic theory of life which had been, in a messure, understood and propounded by Descartes three hundred years ago. But in his time many important functions of our organism were unknown and, especially with respect to the nature of light and the construction and operation of the eye, philosophers were in the cark. In recent years the progress of scientific research in these fields has been such as to leave no room for a doubt in regard to this view on which many works have been published. One of its ablest and most eloquent exponents is, perhaps, Felix Le Dantec, formerly assistant of Pasteur. Prof. Jacques Loeb has performed remainable experiments in heliotropism, clearly establishing the controlling power of light in

a The Mid latert look "Tomod Movemento" companies it is a truth release hearly of transfer and thought of mine. The conscient a or a minimal impression prompting me to any kind of exertion, physical or mental, is ever present in my mind. Only on very rors sectations, when I was in a state of exceptional concentration, have I found ifficulty in locating the original impulses The ty far greater of human beings are never aware of what is passing around and within them, and millions fall victims of and die prematurely just on this account. The commonest, everyday occurrences appear to them mysterious and inexplicable. One may feel a sudden weve of sainess and rake his brain for an explanation when he might have noticed that it was caused by a cloud cutting off the rays of the sun. He may see the inave of a friend dear to him under concitions which he construes as very peculiar, when only shortly before he has passed him in the street or seen his photograph somewhere. When he loses a collar button he fusses and swears for an hour, being unable to visualize his previous actions and locate the object directly. Deficient observation is merely a form of ignorance and responsible for the many morbid notions and foolish ineas prevailing. There is not more than one out of every ten persons who does not believe in telepathy and other psychic manifestations, spiritualism and communion with the dead and who would refuse to listen to

maring or unwill Just to illustrate how deeply A. . : The parties a comical incident. Peshortly . - ' war, . . a exhibition of my turbines inithis City chicited wides read comment in the technical papers, I enticipated that the re would be a rmax among manufacturers to get hold of the invention and I had perticular designs on that man from Letroit who has an uncenny faculty for accuconfident mulating millions. So sarx was I that he would turn up some day, attragraffice that I declared this as certain to my secretary and assistants. Sure enough, one fine morning a body of engineers, Febreauting the Ford Motor Company presented themselves with the request of discussing with me an important project. "Didn't I tell you?" I remarked triumphantly to my employes, and one of them said, "You are wonderfuly Mr. Tesla, everything comes out exactly as you predict." is soon as hard-handed these sixtinguished men were seated I, of course, immediately began to extol the wonderful features of my turbine when the spokesman interrupted me and said, "We know all about this but we are on a special errand. We formed a psychological society for the investigation of psychic phenomena and we want you to join us in this undertaking." I suppose these engineers never knew how neer they came to being fired out of my office.

Ever since I was told by some of the greatest men of the time, leaders in science whose names are immortal, that I am possessed of an unusual mind, I bent all my thinking faculties on the solution of great problems regardless of sacrifice.

المراه المراد ال 79°C " by hims of opinitual indication. But onl are of my existence have I had an experions and filly, impressed me as supernatural. It was et the transit we ther's data. I have become completely emmanatur ut pain and long visilance and one might tas carried to a building about two blocks from our home. As I lay helplass there, I thought that if my mother died while I was away from her bedside she would surely give me a sign. Two or three montas before I was in London in company with my late friend, Sir william Crookes, when spiritualism was discussed and I was under the full sway of these thoughts. I might not have paid attention to other men but was susceptible to his agraments as it was his epochal work on radiant matter, which I had read as a student, that made me embrace the electrical career. I reflected test the conditions for a lock into the beyond were most favorable, for my mother was a woman of genius and particularly excelling in the powers of intuition. During the whole night every fiber in my brain was strained in expectancy, but nothing happened All early in the morning, I fell in a sleep or perhans a swoon, and saw a cloud carrying angelic figures of marvelous beauty, one of whom gazed upon me lovingly and gradually assumed the features of my mother. The appearance slowly floated acros the room and vanished and I was awakened by an indescribably sweet song of many voices. In that instant a certitude, which no words can express, came upon me that my nother had died ind that was true. I have maximum

In a substantial content of the pointal important of the content of a cloud with a group of angels which seemed to actually float in the cir, and this had attack me forcefully. It was exactly the same that appeared in my dream with the exception of by mother's likeness. The music came from the choir in the course, at the early mass of Easter morning, explaining everything satisfactorily in conformity with acientific facts.

This occurred long ago and I have never hed the feintest reason since to change my views on paychical and spiritual phenomena for which there is absolutely no foundation. The belief in these is the netural outgrowth of intellectual development. Religious dogmas are no longer accepted in their orthodox meaning but every individual clings to some faith in a Subreme power of some kind. We must nave hideal to govern our conduct and insure contentment but it is immaterial whether it be one of creed, art, science or anything else, so long as it fulfills the function of a dematerializing force. It is essential to the peaceful existence of humanity as a whole that one common conception should prevail.

While I have to sotoin any evidence in support

of the c. soutions of psychologists and spiritualists, I have proved to my examplete satisfaction the automatism of life, not only through continuous observations of individual actions, but even more conclusively through certain generalizations. These emcant to a discovery which I consider of the greatest moment to human society and on which I shall briefly dwell. I got the first inkling of this astounding truth when I was still a very young man, but for many years I interpreted what I noted simply as coincidences. Mamely, whenever either myself or a person to whom I was attached, or a cause to which I was devoted, was hurt by others in a particular way, which might be best popularly characterized as the most unfair imaginable, I experienced a singular and undefinable rain which, for want of a better term, I have qualified as "cosmic", and shortly thereafter, and inveriably, those who had inflicted it came to grief. After many such a number of friends.

coses I confided this to that who had the opportunity to conviace themselves of the truth of the theory which I gradually formulated and which may be stated in the following few words.

Our bodies are of similar construction and exposed to the same external influences. This results in likeness of response and concordance of the general activities on which all our social and other rules and laws are based. We are automata entirely controlled by the forces of the medium, being tossed about like corks on the surface of the water, but mistaking the resultant of the impulses from the outside for free will. The movements and other actions we perform are always life-preservative

and that ... if quite independent from one another, we " invisible links. So long as the ortanion and it response to the the thet prom to the moment that there is some derangement in eny i self-presorvative power is impaired. Everyboly and aratands, of course, that if one becomes deaf, has his eyesight weakened, or his limbs injured, the chances for his continued existence are lessened. But this is also true, and perhaps moreso, of certain defects in the brain which deprive the automaton, more or less, of that vital quali ty and cause it to rush into destruction. A very sensitive and observant being, with his highly developed mechanism all intact, and acting with precision in obedience to the changeing conditions of the environment, is endowed with a transcending mechanical sense, enabling him to evade perils too subtle to be directly perceived. When he comes in contact with others whose controlling organs are racically faulty, that sense asserts itself and he feels the 'cosmic' pain. The truth of this has been borne out in hundreds of instances and I am inviting other students of nature to devote attention to this subject, believing that through combined and systematic effort results of incalculable value to the world will be sttained.

Dr. Tesla's First Tillutemeton.
The idea of constructing an automaton, to bear out
my theory, presented itself to me carly but I did not begin active
work until 1893, when I started my vireless investigations. During
the succeeding two or three years a number of automatic mechanisms,

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actualed at Mintance, were constructed by me and exhibited to vicitors in my labor ory. In 1 %, however, I designed a complete the constant of the state of operations, but the constant tour C: Cox was derayed until late in 1007. This modules was il. I ted and described in my article in the Century Magazine or a find, and come periodicula of that time and, muon first chewn in the beginning of 1898, it created a sensution such as no other invention of mine has ever produced. In Movember, 1898, B basic putent on the novel art was granted to me, but only after the Examiner-in-Chief had come to wew York and witnessed the performance, for what I chaimed sommed unbelievable. I remember that when later I called on an official in Washington, with a view of offering the invention to the Government, he burst out in laughter upon my telling him what I had accomplished. Bobody thought then that there was the faintest prospect of perfecting such a device. It is unfortunate that in this patent, following the advice of my attorneys. I indicated the control as being effected through the medium of a single circuit and a well-known form of detector, for the reason that I had not yet secured protection on my methods and apparatus for individualization. As a matter of fact, my boats were controlled through the joint action of several circuits and interference of every kind was excluded. Most generally I employed receiving circuits in the form of loops, including condensers, because the discharges of my high tension transmitter ionized the sir in the hall so that even a very small serial would draw electricity from the surrounding stmosphere for hours. Just to give an idea. I found for instance, that a bulb 12" in diameter, highly

action, would deliver well on to one thousand successive to for all order of the air in the laboratory was neuthe loop form of receiver was not sensitive to such it is obtained it is curious to note that it is becoming popular at this late date. In reality it collects much less energy than the serials or a long grounded wire, but it so happens that it does away with a number of defects inherent to the present wireless devices. In demonstrating my invention before sudjectes, the vicitors were requested to ask any questions, however involved, and the automaton would answer them by signs. This was considered magic at that time but was extremely simple, for it was myself the gave the replies by means of the device.

At the same period another larger teleutomatic boat was constructed, a photograph of which is shown in this number of the Electrical Experimenter. It was controlled by loops having several turns placed in the hull, which was made entirely water-tight and capable of submergence. The apparatus was similar to that used in the first with the exception of certain special features I introduced as, for example, incandescent lamps which afforded a visible evidence of the proper functioning of the machine and served for other purposes.

These automats, controlled within the range of vision of the operator, were, however, the first and rather crude sters in the evolution of the Art of Telautomatics as I had conceived it. The next logical improvement was its application to automatic mechanisms beyond the limits of vision and at great distance from the

cer of control, of I have ever since advocated their employment as instruments of warfare in preference to guns. The importance of this now seems to be recognized, if I am to judge from casual since menents through the press of achievements which are said to be entraordinary but contain no merit of novelty whatever. In an imperfect manner it is practicable, with the existing wireless plants, to launch an aeroplane, have it follow a certain approximate course, and perform some operation at a distance of many hundreds of miles. A machine of this kind can also be mechanically controlled in several ways and I have no doubt that it may prove of some usefulness in war. But there are, to my best knowledge, no instrumentalities in existence today with which such an object could be accomplished in a precise manner. I have devoted years of study to this matter and have evolved means, making such and greater wonders essily realizable. As stated on a previous occasion, when I was a student at college I conceived a flying machine quite unlike the present ones. The underlying principle was sound but could not be carried into practice for want of a primemover of sufficiently great activity. In recent years I have succeasfully solved this problem and am now planning serial machines devoid of sustaining planes, ailerons, propellers and other external attachments, which will be capable of immense speeds and are very likely to furnish powerful arguments for peace in the near future. Such a machine, sustained and propelled entirely by reaction, is shown on one of the pages and is supposed to be controlled either

to be precticable to project a missile of this kind into the sir and drop it almost on the very spot designated which may be thousands of miles away. But we are not going to stop at this. Telautomata will be ultimately produced, capable of acting as if possessed of their own intelligence and their advent will create a revolution. As early as 1898 I proposed to representatives of a large manufacturing concern the construction and public exhibition of an automobile carriage which, left to itself, would perform a great variety of operations involving comething akin to judgment. But my proposal was doesed chimerical at that time and nothing came from it.

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At present meny of the ablest minds are trying to devise expedients for preventing a repetition of the awful conflict which is only theoretically ended and the duration and main issues of which I have predicted in an article printed in the Sun of December 20, 1914. The proposed League is not a remedy but, on the contrary, in the opinion of a number of competent men, may bring about results just the opposite. It is particularly regrettable that a punitive policy was adopted in framing the terms of peace, him a few years honce it will be possible for nations to fight without armies, ships or guns, by weapons far more terrible, to the destructive action and range of which there is virtually no limit. Any city at a distance whatsoever from the enemy can be destroyed by him and no power on earth can stop him from doing so. If we want to avert an



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Sec. 1: . . admitt meeting of the stockholders of this Company shall is held it the office of the Composition on the third Thursday in January of each and every year at i F.M. for the election of directors and such other business as may properly come before the meeting. Notice of the time, place in object of such meeting shall be given by publication thereof at least once in each week for the successive meets immediately preceding such meeting in the manner required by the Stock Composation Law and by mailing at least six days previous to such meeting, posture preprid, a copy of such notice, addressed to each stockholder at his P.M. address as same shall appear on the books of the Company. To business other than that stated in such notice thall be transacted at such meeting without the uninious concept of all stockholders present therest in person or by promy.

Sec. 2: Special meetings of the stockholders other than those regulates by statue may be called at any time by a major-

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Company shall be held at the office of the Corporation on the third Thursday in January of each and every year at 4 F.M. for the election of directors and such other business as may properly come before the meeting. Notice of the time, place and object of such meeting shall be given by publication thereof at least once in each week for two successive masks immediately preceding such meeting in the manner required by the Stock Corporation Law and by mailing at least and days previous to such meeting, postage prepaid, a copy of such notice, addressed to each stockholder at his P.D. address as same shall appear on the books of the Company. No business at aer than that stated in such notice shall be translated at such meeting without the ununimous concent of all stockholders present thereat in person or by promy.

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Sec. 2: Special meetings of the stockholders other than those regulated by statue may be collect at any time by a major-

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Degree of either in trush or by proxy stockholders owning at least three-fifths of the capital stock of the Corporation in order to constitute a quorum except at special elections of directors pursuant to the Constitute Constitution Law.

Sec. 4: Atall unmul rectings of stockholders the right of any stockholder to vote shall be governed and determined on prescribe in the small Corporation Law.

Sec. 5: If for any relate the annual meeting of the stockholders shill not be hill a hereinbefore provided, such unnual meeting shill be a lied and conflicted as prescribed in the General Corporation Law.

Sec. 6: At all meetings of the stockholders only such persons shall be entitled to note in erson and by growy who appear as stockholders on the transfer books of the Company for ten days immediately preceding such meeting.

Sec. 7: . t the annual maeting of stockholders the follow-

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the state of the special continuations, so that to the special countries and the election, and ell countries which is executely regulated to the special continuation of t

to the first of the control of the stock cote in in that case, such stock cote in the stock cote in the stock cote in the stock cote in the stock cote for each in person or by rowy shall be entitled to one vote for each share of stock command to man. All voting on line in viva voce', except that a stock cote is vote shall be by it list, each of union chall stote the mane of the stockholder voting and the number of shares owned by him, and in station, if such tellot be a stable by a growy, in shall else state the number of such growy.

Sec. 3: At special meetings of stockhollers the provisions of the Ceneral Jorganution Lew shall apply to the cesting of all votes.

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The amplified tend by a continuous shall die or a continuous and a continuous that the continuous and a continuous and the amplified and a continuous and a continuous and the amplified for their election at annual meetings.

fec. 4: The Board of Directors day dopt such rules for the regulation of their destinguish the comparation as they by descriptoper, not inconsistent with the Laws of the St to or Me. Your or their by-laws.

Sec. 8: The Do rd of Directors sholl need at such reguler times as they by fir and therever a lied together by the President upon due notice given to else Director. On the written request of any Director, the Secret my shall call a special meeting of the Board.

Sec. 6: All Jon Att-es shill be prointed by the Board of Directors.

ADDIDED HIL.

CTETTES.

Sec. 1: The Board of Directors limeter by after the and nucl meeting shill choose one of their mader by a dijerity vote

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APTICLE V.

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ITTELLS VI.

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Sec. 7: Two is profess of the option should be closest to each annual acting of the decimal and to the terms for one year.

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WITH THE LET EAST IN OUR WRITE LUCKTLETON

In subduing the forces of deture to the convict men must invariably avail himself of some process in which a fluid acts as carrier of onergy, this being an essential stop in any industrial undertaking dependent on mechanical power. Evidently them, a discovery or radical departure in that domain must be of extreme importance and fur-resching influence on the existing conditions and phases of modern life.

Pluid provelsion is now effected by means of pintone, whose or blades, which entail complexity of construction and impose many limi-

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slu, likel.
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tims., 20 p.

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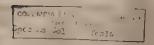
The rists is much continued to the Rice Book and Marry continues a book of the book of the completion of the record of the continues.

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taiting on the propalling on well as propelled continues and its performance. Total has distinct with these devices and produced machines of cotracted any completely which, moreover, are in easy other respects superior to the out types universally employed. A few words will be sufficient to convey a clear idea of his invention.

possesses two solient properties: adhesion and viscosity. Owing to the first it is attracted and clings to a metallic surface; by virtue of the second it resists the separation of its own particles. is an inevitable consequence a cor-

-2-



Tesla, hikola
Paulais how gretom of laid (repulsion type, m.d.
tymo, 20 p.

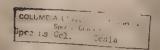
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This choice opy must be risked to the Rice Boot and Michael Fifth and Bottle Library of the completion of the research.

thin mount of fluid is dragged along by a body propolled through it; convoraely, if a body be inacel in a fluid in motion it is impelled in the direction of movement. The practical force of Toela's apparatus consist of flat, circular disks, with central openings, mounted on a shaft and enclosed in a casing provided with ports at the peripheral and central portions, when deriving energy from any kind of 'luiu it is a mitted at the periphery and escapes at the centre; when, on the contrary, the fluid is to be energized, it enters in the centre and is expelled at the periphery. In either one it traverses the in-

-3-



Tesla, hikolo
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Pepe, hada
tomse, 20 pe

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at margy of stoam or explosive mix
a be transformed with night economy in
to mechanish effort; motion transmitted from

one that to another without solid connection;

vessels may be propelled with great speed; wat
er raised or air compressed; an almost periest

vecuum can be attained, substances frozen and

gases liquefied.

while this improvement has the bronduces and applicability of a fundamental mechanical concept, the widest field for its

-4-

Species Sol Sesta

Tesla, Likola Tesla: New System of Nuzd Propulsion P.P., n.d. t.ms., 20 p.

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This flots up multiplication to the Rice Boot and Marke rich Live y 801 But el Liberry) in the complete on the invertible.

"yranic conversion of energy.

The commercial value of a prime
Year is determined by its efficiency, specific

Externance relative to weight and space occupied,

cheapness of nanufacture, sefety and reliability

of operation, adaptability to construction in

large units, capability of running at high peripheral velocity, reversibility, and a number of other

features of leaser importance. In the majority of

these a machine, operating on the new principle,

excels. But there is one quality which is most

desirable in a thermo-dynamic transformer from the

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corenaly

Tecla, likel:
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THIS IS A PHOTOCOPY OF ORIGINAL MATERIALS IN THE COLUMBIA UNIVERSITY L BRARIES.

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necessarie point of view, and that is great resist-

The employment of high temperature is

it was vital bearing on the efficiency of prime
Little that it is of peramount importance to extend
the thormal range as far as practicable. In the

present state of the art salical progress towards

more commical transformation of the energy of
fael can only be achieved in that direction. Such

being the case, the capability of the machine to

withstand deteriorating effects of great host is

the controlling factor in determining its com
mercial value. In that most desired quality the

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Species Col. Tesla

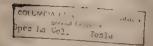
Tesla, Likola
[Tesla], hew System of Fluid Propulsion
n.p., n.d.
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This choice only must be a stamped to the Rine Book and Manus cost Library (801 Bothe Library) at the completion of the remoth use.

- to turbine surpasses all the older types of heat actors. The Diesel and other internal comhad an engines are fatally limited in this rethet '; their complete dependence on closely fitting sliding joints and unfailing supply of clean lubricant; while in the present forms of turbines buckets, blades and inherent mechanical deficiencies impose similar restrictions. These parts are too delicate and perishable to serve as elements of a gas turbine and this has been the main obstacle in the way of its successful reslization. The rotor of the Tesla turbine presents a relatively enormous



Tesla, likola Peslatu hrw Jynten of Fluid Propulation R.P., and. t.ms., 20 p.

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in the time in the usual destructive manner, flows

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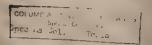
of reter is not impaired to any sepreciable degree

by a roughening of the disks and that it operates

entisfactorily even if the working medium is cor
resive to an extent.

motive power under cortain standard conditions, settled upon in the course of time, gradually forced upon the minds of engineers the Funkine

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Testa, hikola Pestate hew system of Point Propulsion Pops, nada tamsa, 20 pa

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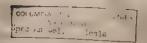
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The relative py multible return of the the Rice Boot and Minn and Lib ary (80) Buttle Lib ary) of the completion of the relativities.

long continued endeavors to improve the same have finally resulted in complex multistage constructions entirely unswitched for high temperatures.

A final turbine, by virtue of its exceptional half-resisting has constructed in exceptional half-resisting has constructed and enter union properties, was a possible the attainment of rest fuel economy with but a single stage, incidentally offering the additional seventy es of an extremely simple, small, compact, and reliable mechanism. But perhaps the chief convercial value of this new primemover will be found in the fact that it can be operated with the chargest grade of crude oil.

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Tesla, likela (colat. her system of .luid prepolation Pope, R.d. t.ms., 20 p.

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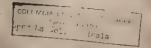
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The matrices of the reference to the Rice Book and Manne and Lite 7, 1891 Butte. Library of the rome choice the re-fer circles.

riscrable quentities of frit, sulphur and other impurition, thus enabling west sums of noney .. to enved annually in the production of possr · m fuel.

The lesis turbing also lends 1 . will to use in conjunction with other types, especially with the Tursons with which it forms an in eal combination. Although its practical introduction has been delayed by the force of circumstances, a number of years have been spont in examustive investigations and experiments on the bosis of shich the performance in any given case can be closely esloulated. The first public tests were made before the

-10-



Tesla, Mikola Pesla: Low System of " and Propulsion P.P., n.d. t.ms., 20 p.

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of the New York Edison Company where several machines, ranging from 100 to 5000 h.p., were installed and operated with gatisfactory remails. That the invention was appreciated by the technical profession may be seen from the excerpts of statements by experts and periodicals printed on the amsered page.

The selient saventepes of the Tesls turbine may be summed up as follows:

EFFECT-NCY: The most economical of the present primenovers is the Diesel ongine.

But, quite sport of rony prectical and com-

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per us Sol. Resla

Tesla, Nikola Tesla's New System of Fluid Propulsion F-p., n.d. t.ms., 20 p. THIS IS A PHOTOCOPY OF ORIGINAL MATERIALS
IN THE COLUMBIA UNIVERSITY LIBRARIES

This shall appy mult be returned to the Rice Bool and Manul tint Library (80) Bulle. Library) at the completion of the relief suse.

recoind drawbacks, immorphable from this type, it is entirely incomment on comparatively orpencive oil, so that the Tools Gas Turbine, working with much changer fuel, would have the botter in competition ov n if its efficiency as a the mongraphic transformer were appreciably lower, all the morero in view of its greater machanical perfection.

Referring to turbines, all of which we curposed by the Persons in economy as well as extent of use, definite limits have already been reached and the only possibilities of saving fuel exist in the employment of stem at very high surerheat

-12-

Resla, hakela Reala's how dystem of Flied land (Sion Page, And. times, 20 pages THIS IS A PHOTOCOP+ OF ORIGINAL MATERIALS IN THE COLUMBIA UNIVERSITY LIBRARIES

The reals applied to entern 4 to the Rice Booken't Mine contit here, BAT Butte. Library at the completion of the relativeses.

and utilization of the cr oil as motive fuel. But none of the primemovers mentioned is odapted for such operation and although every effort has been made in this direction, no eignal success has been whiteved. The superheat is at nost 250° F, this being considered the maximum permissible. All attempts to considered which we will be considered the first the thought are failed chiefly because of the inability of bucket etructures to withstead the action of intense heat. The Teela Turbine can operate quite entisfactorily with the motive egent at very high temperature and, owing to this quality.

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COLUMN A COLUMN ACCOUNT A COLUMN ACCOUNT

Peslats her system of Pluid Try Usion 1.79, n.d. t.ms., 20 p.

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lands itrelf exceedingly well to these purposes.

created property of the second of the second

CHREEKESS ON WARDER CTURE: The new turbine oun be produced without a single machined part except the shaft, all the cirks being pusched

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posits Col. fesla

Tesla, hikola fesla: New system of Fluid (rop dation F.P., n.d. t.ms., 20 p. THIS IS A PHOTOCOPY OF ORIGINAL MATERIALS.
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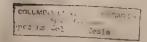
This obstace, must be a term that a R in Boot and Manual and Libert, 1891 Butle. Linearly at the completion of the century use.

and the comings pressed. By this method, with proper inchinery inctalled on a large scale.

the cost of production many or reduced to a figure mover deemed possible in the construction of an engine. Fast is more, this can be done without material scarifice of efficiency as small observaces are not ossentially required.

saminy are reliability or operation: There is an ever present danger in the running of high speed nuchines. A bucket turbine may at any moment run away and wreck the plant. Such accidents have noppened again and again and take

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Trola, Mikel:

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F*P*, R.d.

tems*, 20 p*

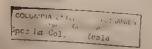
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This chairs epy multiper retenant to the Riac Boot int Minus contible in 1891 Butter Lib. Try of the completion of the restant use.

A remarkable quality of this turbine is its complete sufety. As regards the "war and tear of
the propelling organs it is significant and, in
any event, of no conceptance on the performance.

all the present mechines there is a distinct limit to capacity, for although large units can be manufactured, they are very costly and difficult to manage. The new turbine is so simple and the output so large that the limits in this direction can be greatly extended.

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Esla, hikola iesla*, hew dystem of Fluid from laton refe, n.d. t.mae, 20 p. THIS IS A PHOTOCOPY OF ORIGINAL MATERIALS. IN THE COLUMBIA UNIVERSITY LIBRARIES.

This chairs applying the crossing to the Rice Book and Micro Life Lib. 27 (80) Build Lib ary list the completion of the research use.

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whelming advantage over the old types in which the maintenance of smooth surfaces and sharp edges is indepensable to sificion working.

In the tests turbins, for the rescons already stated, the destructive actions of heat and corresive agents are much less pronounced and of relatively negligible effect. This fact has a most important bearing on the naving of fuel.

CAPABILITY OF PURPLICATION POINT POINT SPEND: In this respect also it is superior to others.

The rotating structure carries no losi and in

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COLUMBIA (* N. LEJEANE),
Spec. G. ...
Spec. Es Col Tesla

Resla, Mikol, Instal, how Symtom of Mused Tropilsion Papa, Pada, tames, 20 pa THIS IS A PHOTOCOPY OF ORIGINAL MATERIALS IN THE COLUMBIA UNIVERSITY LIBRAR ES.

The most, op, method remod to the Rine Book and Manus and Lie ary 1801 Buffe Lib ary) at the completion of the reliable.

expollently ada ted to withstand tensile
etrosess. Judging from the most mount turbine practice this cuelity chould be of special value.

greatly handicapped by their incombility
of reversal which is a very serious defect
in certain applications, as the propulsion
of vessels, reconstituting the employment of
suziliary turbines which detracts from the
propulsive power and sade materially to the
cost of production and maintenance of the
equipment. The Tools Jurbine and the unitue

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COLUMNIA (**. PARTIES - Specific to)

Tesla, tirola Teslate how system of Fluid Iron Ision Pers, P.d. tems., 20 p. THIS IS A PHOTOCOPY OF ORIGINAL MATER ALS IN THE COLUMBIA UNIVERSITY LIBRARIES.

The cloth of method to the Reabolton's Memorial Libert Book Book Burle, Liberty in the completion of the incompletion of the i

property of boing reversible; not only this but it operates with the name efficiency in either direction. For marine purposes it therefore constitutes an insul motor whether used alone or in conjunction with older types.

Becides the above it possesses other desirable features, constructive and operative, which will add to its value and adaptability to many insurtrial and commercial uses as, reilressing, marine nevigation, sorial propulsion, generation of electricity, refrigoration, operation of truess and automobiles, hydraulic conting, agriculture, irrigation, mining and cimilar purposes.

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Process Col Torla

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The cost, spy must be estore, to the Rice Boot and Minimum test Liberry (80) Botte. Liberry, at the ampletions of the control use.

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the turbine on binned / the emilitie."

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Reynold James, Chief princes, hivered transferior Co: "It is a proof invention."

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Brigadior file of the for court tend: "formathing new in the world.

Official was intity in warred in it."

Filler Proper interior in the real of it."

Filler Proper interior in the real of it."

Final Trinyi, Chief in iner, Celfeurungs-Goodlepanit, Commany:

"The fides of ine to live outlier."

P. R. T. Collins (Power Plant to nomint): "It is a wanderful turbine."

The Motor ordi: "The new rinesple undertined; is a frest constribution to softened in the ring, front in its of miplicity and breach of application."

Soientific American: "Considered from the acception at the turbine is astembringly simple and continued in construction, about from any sint tractory no to place it, in once of the series tractory of any type of them or for her as tractory of any type of them or for our of the present day."

Fingineering "reazine: "An entirely as formed from a present day."

Tochnical of "grazine: "The onle formine is the apotheosis os simplicity at is so violently opposed to sill procedent that it repus unbelievnols."

From Eurorous Articles and Cormonts:

The turbine is different in principle to may hore-tofere to use as one side will the loss recorded less could take the 'o.t or inc hos running asserted and in eyes less with remap a revolutionery result."

"Posult: teen ray lutionery to its joint of tiresgring the inserie thousand the "This motor will revolutioning to turbine inserie the traditionary conservation to the turbine inseries the inseries the inseries that the turbine inserting the inseries that the turbine inserting t

COLUMP A . T V. ipes is Col.

esla, Likola Total's how System of Fluid From Ision t.p., n.d. t.ms., 20 p. THIS IS A PHOTOCOPY OF ORIGINAL MATERIALS IN THE COLUMB A UNIVERSITY LIBRARIES.

The charty opy multiplication also be Rice 800's and Manner of Liberry, 801 Buttle Liberry) of the completions there of use.



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VID OF NEW YORK

Office of the Secretary of State

Albany, August 9, 1916

Geo. Schereff, Esq.,
Secy., Tikola Teula Co.,
8 West 40th St., N. Y. City.

Dear Sir.

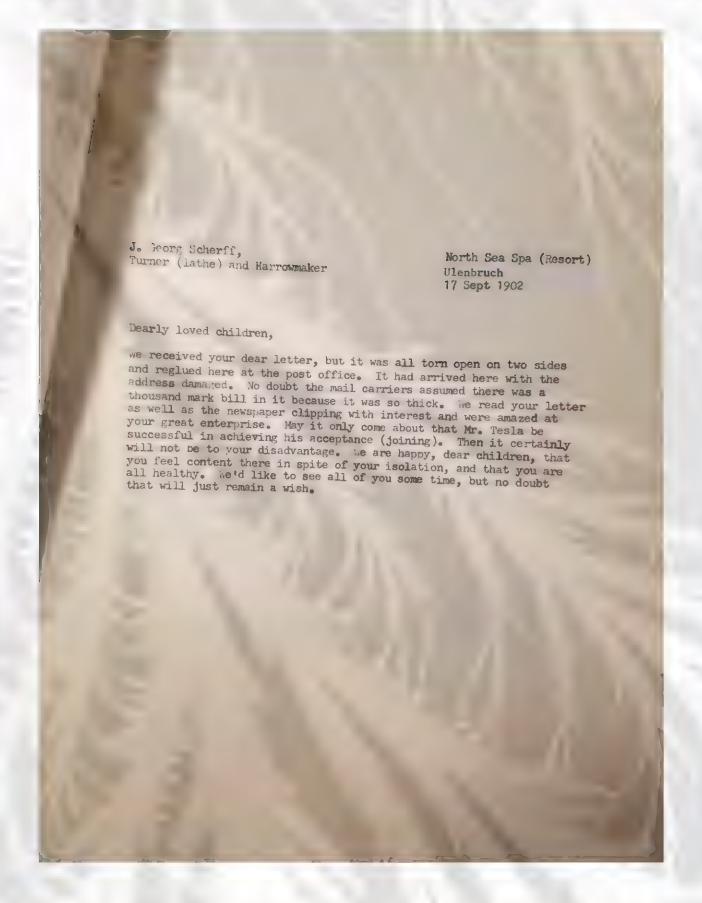
Enclosed herewith please find check for \$1.25., the amount of overpayment of fees in relation to the Geri into of incorporation of Tesla Company, Inc.

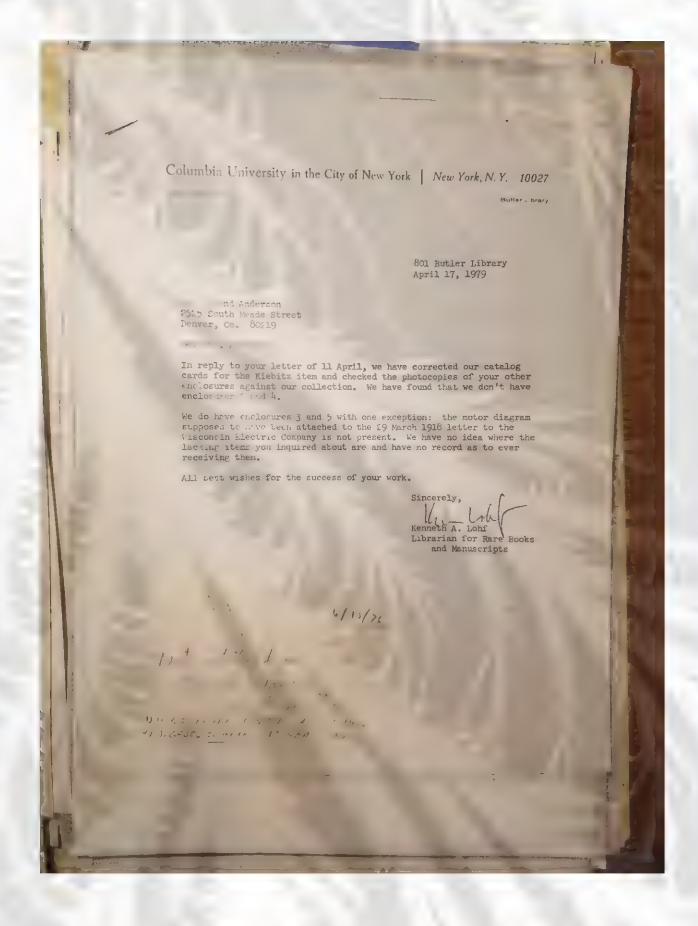
Yours respectfully,

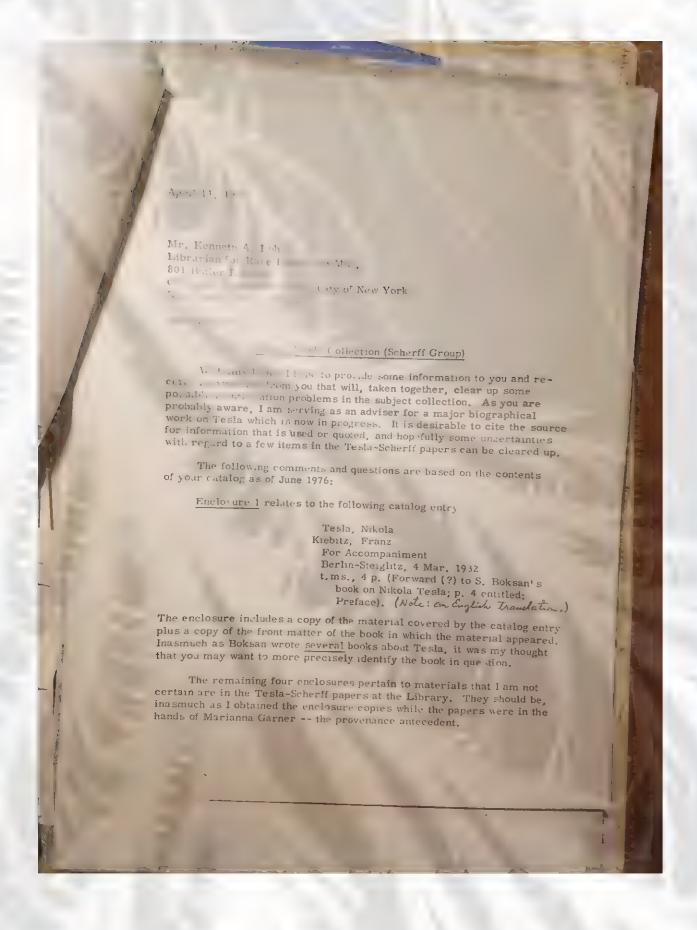
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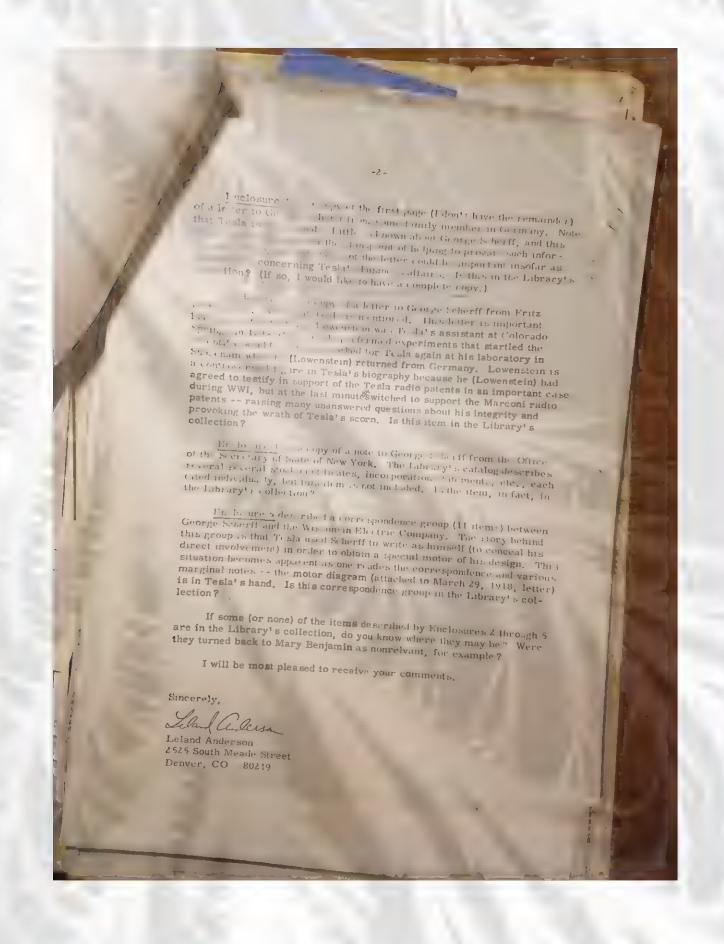
Secretary of State

J. Georg Scherff. Horder but a 9 17 Fir 4:02 Drechsler und Egenmacher Justing galiable France present lister Exist about spir invited or your whom in to the town your in for flow und find wife des flight wine you to the Tains No wifffeif I fin ha finant simplings wie of of fight sied for All Finance Person uguil for Distagow. wir in wir Some Exist for upic Son Bai La well Cont for the sent goodings to and son Just grow Saraliza Was to angine mond of mind explinion, has Gene Tesla fil from Dies & Cabo Binder Sunt sief In in Sav Pinform Hail out ago fifth, send if will Go has hing where utor das year maft air Bline fit ithen











FRIIZ LÖWENSTEIN
INGENIECH

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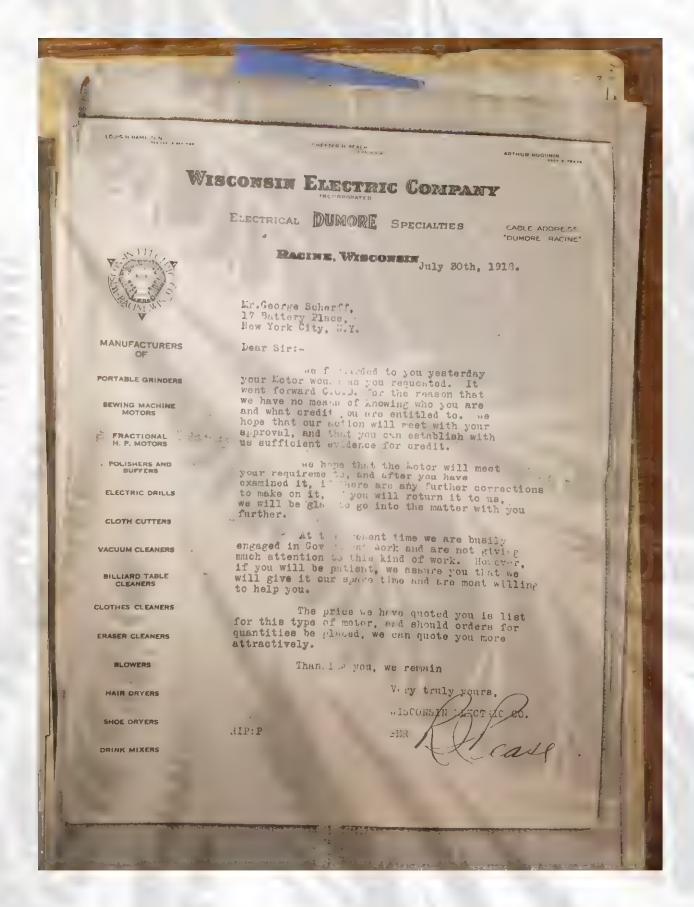
Leute nuruckgekeint von der Land nach Herrn Director Singe beile ich mich Ihnen mitst eilen, iass ich von ienselben die Zustimmung zur vorzeitige. Lösund neines Contractes erhielt. Wir sind nur dest darüber, einen Tacafol, er für meinen Posten zu bedermenund hoffe ich, iass ierselbe is Laufe der rächsten Weche wird eintreffen können. Die Geschäftsübergabe werde ich dann seur beschleunigen g kann jedoch den Zeitpunkt meiner Afreise Leute noch nicht fixieren. Jedesfalls aler bin ich vor Ende Pehruar bei Innen, wersuf ich nich seien sein freise.

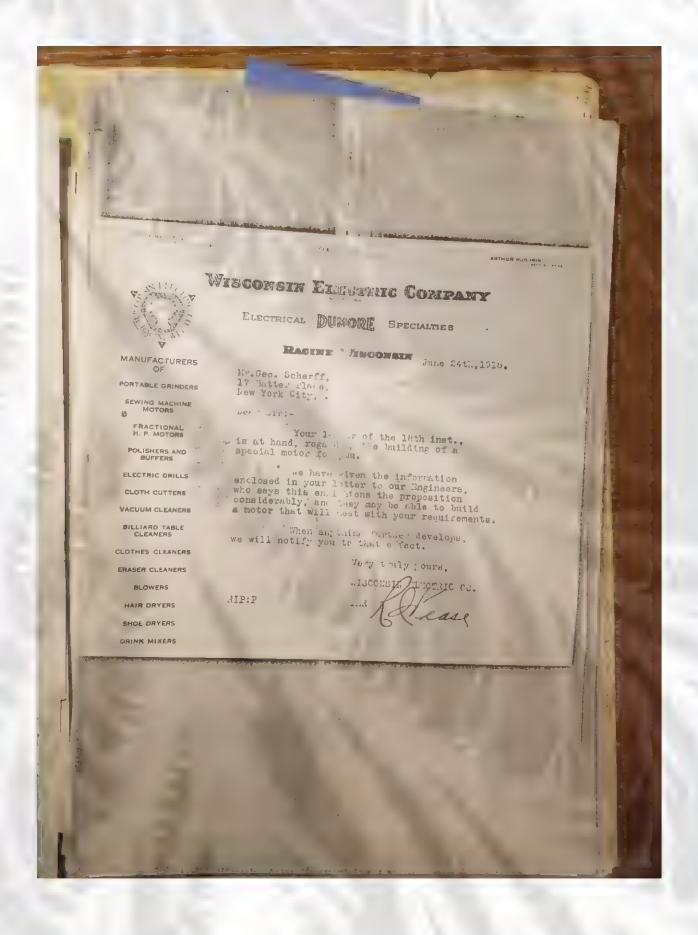
Die Sendung von 250 Malar, die ich Betatige und für welche ich Berrn Tesla meinen besten Dank sagen lasse, durfte bereits mehrere Tage bier a Postant meiner geharrt halen.

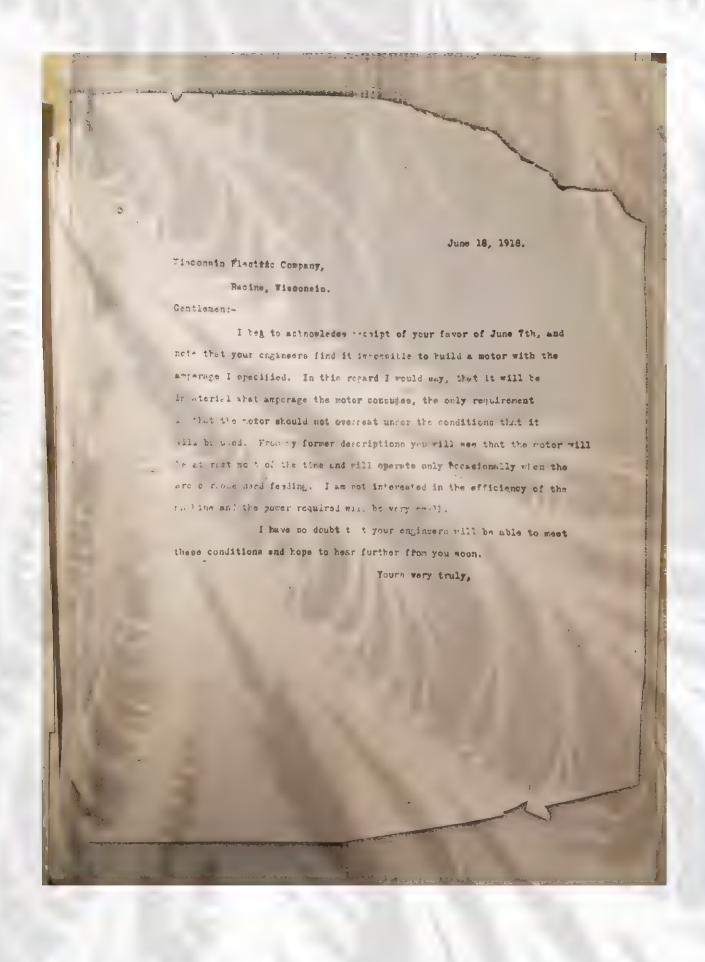
Ich bitte Sie Herrn T ela meine höflichste Empfellung bestellen zu wollen.

Mit vielen Grüssen un i den duruf "Auf ein recht arbeitsfreudios"

frits breustein







Wisconsin Electric Company

CHECK DIN HEACH

D'I WILL SPECIALTIES ELECTRICAL

CABLE ADDRESS DUMORE RACINE

ARTHUR HUGUNIN



T by

RACINE. WISCONSIN June 7th, 1916.

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BLOWERS

HAIR DRYERS

SHOE DRYERS

DRINK MIXERS

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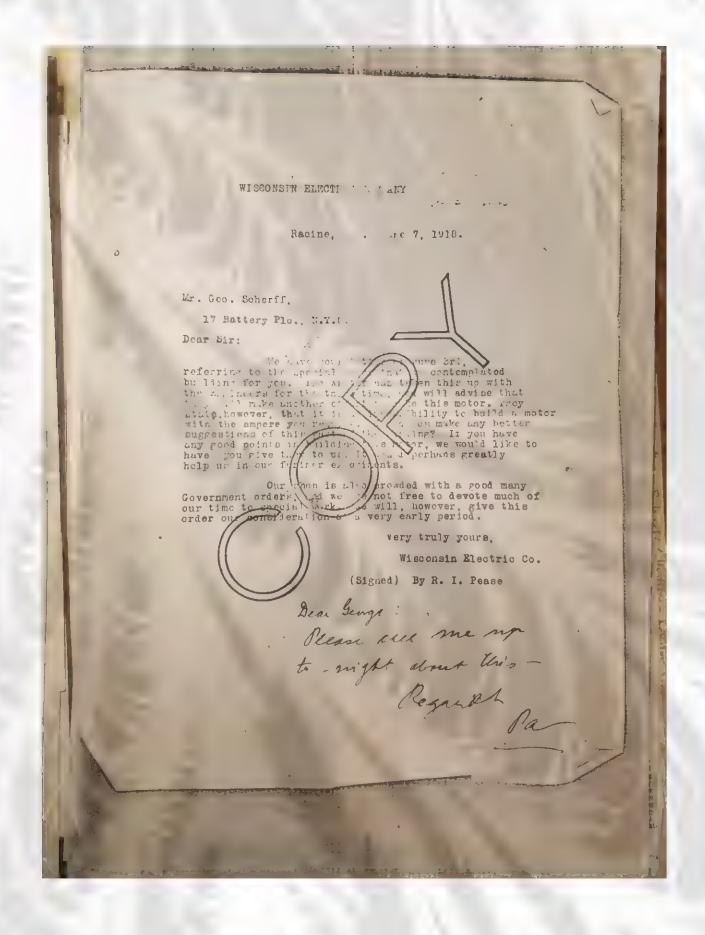
good miny Gov. to devote much at a very ear!

" " r further experiments. r i also crowded with a coders, and are not free time to special work. this order our consideration

y . " of June ori

Very truly yours, JISCORY WICTIE

has nice of the as were muse.



June 3, 1918.

Wisconsin Flactric Company,

Pacine, Wisconsin.

Genelemen:-

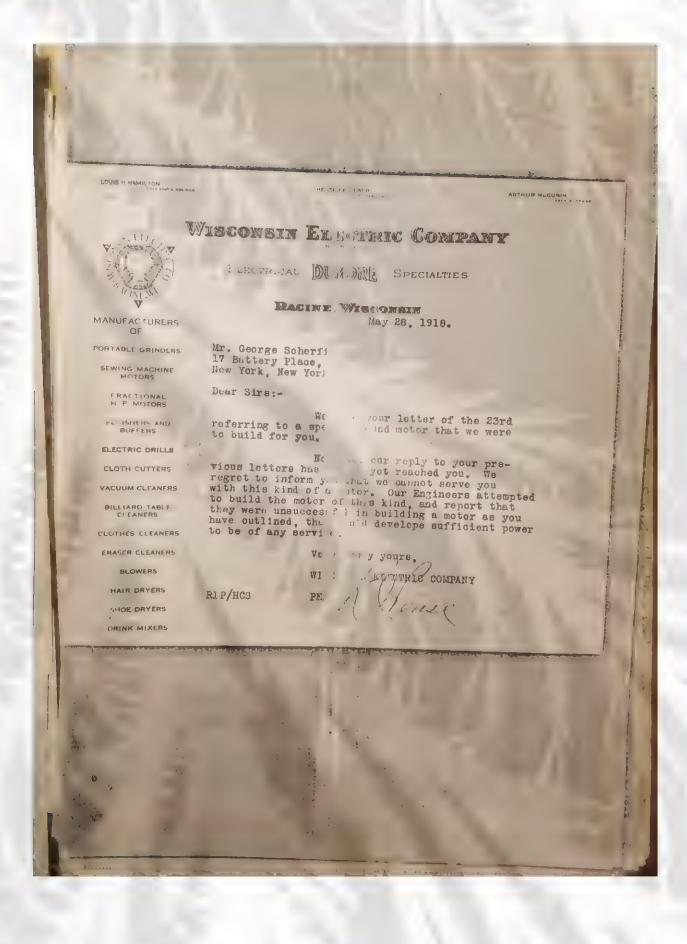
I beg to acknowledge receipt of yo r favor of May 28th, and note your remirk, that the special color wound according to my specifi-

do not know, of course, under " in c with my are centr. would send ro the moon that you

to manufacture myself.

cations would not develop suffir power to be of any service. I "littone you have operate: the motor, but t's fact is, that I have th: "I" tos'ed the idea and would a motor myscl sons time ago in the same . Thich cherated satisfactorily T 'and conflident, therefore, if you tracted and give me an opportu-somebody who will make these machia : for me in quantity, as I have not the necessary facilities; the eth-r warts of the arc controller I intend

> Poping to hear further . ; ou at an early date, I remain, Yours very truly,



May 23, 1918.

Visconsin Flectric Company,

Pacine, Wisconsin.

Gentlemen:-

I beg to refer you to a letter of April 23rd and previous correspondence on the subject of a specially wound motor, which you were to make for me, and induirs when I may expect to receive this machins. There is a large dear of device in which this refer is to be used. I am very anxious to the large and shall be obtained if you will do what you content, delivery.

- Lite Bankley - Charles

Arril 23, 1918.

Tisconsin Electric Company. Racine, Fisconsin.

Gentlemen:

account of my absence from the City.

I thank you for your readiness to make up the special notor for me and in reply to your quistions wish to say the

controllers for oving picture rachines and projection with arc I. practice one of the field windings is connected across the arc and the other across a rheostat in opposite direction, so that then the current through both circuits is equal, the han, nowave, the carbons burn away, the current through one of the circuits at prepondents, the foctor will the act the current through one clearest the carbon feeding aschanies, feeling the carbons to—there controllers are the carbon feeding aschanies, feeling the carbons to—the octor, therefore, whould have a strong starting torque with a I should like you to use for this minsing one of your

I should like you to use for this winding one of your universal notors, so that I may be able to make some tests with rections to take care of any change in the line voltage. In the deforming drinks, and I think that your Type C notor will on this notor is of sufficient length. The shaft extension

Trusting that with this additional information you will be able to make up the motor for me, and hoping to hear further from you soon, I remain,

Yours very truly.

WISCONSIN ELECTRIC CO., RACHLE, WISCONSIN.

April 4, 1918.

Mr. George Scherff, 17 Battery Place, New York City.

Dear Sir:

Your letter of March 29th, is received in reply to ours of March 15th.

We have given this drawing to our engineer who reports that the diagram is very clear, but for our information we must know the following:

What current is to be wound for: A.C. or D.C.? What direction of rotation is necessary and what is the approximate H.P. required at any given speed? Is the shaft extention on the Type C of the correct length?

It would further aid us in building this motor if you know, and if you care to tell, what you are using this machine for.

We would state definitely that we will be glad to build this motor for you.

Thanking you to give us this information, we remain,

Very truly yours.
Wisconsin Electric Co.

March 29, 1918.

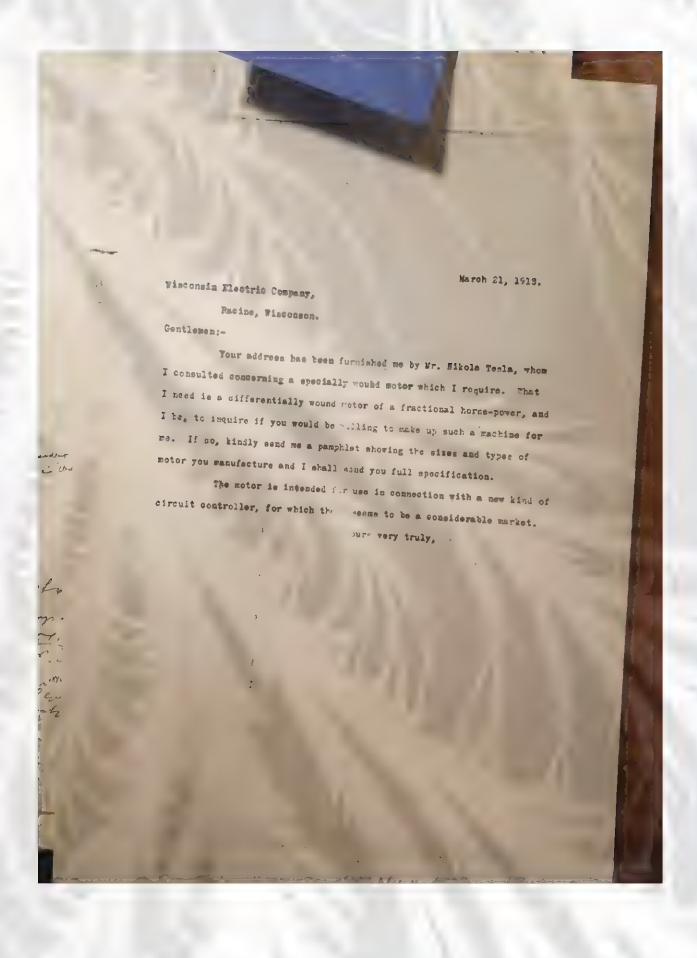
Wisconsin Electric Company
Racine, Wisconsin.
Gentlemen:=

I beg to acknow receipt of your favor of March 25th, in reply to my lette he Blet. I find that I have not rade myself clear, as you . of seem to have understood my question. I am awars, of cours '; ou do not have differentially Whom is noters in stock, an ry has the purpose of asking, if you rould be willing to such a machine for me. What I need is merely a special 1. sinding on one of your regular motors, and I enclose a diazr m enowing this winding. The fields should be wound with two wires, both wires being wound at the same time, thus making two ': Is for each field. One set of there field coils should be ented in series - see circuit A of diagram - and the other set . . i be connected in series with the armature - see circuit B of approx - and the four terminals brought cut. Another important requirement is, that each one of the circuits A and B should take no tore than about one twentieth ampere on a 60 volt circuit. I believe that your type C motor would suit my rurpose, if it is possible to get the required field windings into this totor, otherwise . The D motor will do. Your engineer, of course, will have no dif . . 't' in determining this from the iata given.

I beg to enquire in, if you are willing to make up this machine for me for a t . In if you are willing to make up this machine for me for a t . In if you are willing to make up

Fisconsin Electric Co. 1 19, 1918. -2of the same in lots of on , two and three hundred. Your machine has seen recommended to me by Mr. Nikola Teela, and therefore I should like to use it in connection with my controllers. Yours very truly, Encl.

131 I his a heardery . 12, Hecolb. 1- m is my field cois with the wise - winding both who at the same line. On est of full will is 1 3/ 71 to be conserved in all . , Received A . . . 5 of izing, I in a sir brown 12 and . The other will it ot an " " " c to it is with the arm of see received ... a consist is laps . Thepere on be met,



T SLA, Hikola physical Clootrician, inventor; b. miljan, dita, border country of Austria-Hangery; sen of a Michigan Careet, were man and orator, and of Good ican Carlie, a fency, were man and orator, and of Good ican Carlie, a fency, were and inventor, those fath a car be at inventor; differ clomentary school of native class, "mark in public scheel in Goodie, alike, 4 years in Lover Real chool, Goodie, and 5 years in Higher Feal Colyth, Carletadt, "mark in where was grad. 1873. Originally destined for the clorgy, but have the interest of the condition of the Polytechnic chool in Grats, there for four years he studied mathematics, "lected and mechanics, "Decimy with the years in while condition at mile of a mathematics, and cancer, 1831, in Budapest, Hangery, where he made his first electrical invention, a telephone respector, a lecanoived the idea of his restings genetic field; hence went to France and Cambary, where was successively entered in various branch as of engineering and resustanting the marketure; san also and generative of income and resustanting when a first observative was recessively entered in various beanch as of engineering and resustanting the investigation of an inventor of clootrics of these leaves of engineering and advance. Sephase, multiphase and prophase system of also matter as an addressed and the following the factor of these, 18 9; transmission of activity disclarges, 1889; generators of high-free money carrents and effects of these, 18 9; transmission of occurred lighting by Tesla tubes, 1991, novel by ter of electric free unity effects and phenomena, 1991-93; system of an income and conditions and conditio 1812 -the in the oscillators and generators of electrical oscillations, 1896-95; Aresourches and Creaveries in redictions, naterial treams and cranatics, 1896-98; high-poential regnifying transmitter, //; by ton ef transmission of never vithout wires, 180-1; economic transmission of theory by refrigoration. We can't of Teleutenetics, 1899-99; discovery of a life my electrical waves in the earth, 1899; burning of atmospheric nitrogen, and preduction of other electrical effects of transconding in-

NIKOLA TENLA, Electrician, Chymicist and inventor, born 1857 in Smiljar, Lika, borter courtry of Au trin-Hungary, as the son of a distingushed Grand correspondent orator, and of Georgiana Mandie, a famous woman and inventor, whose father was also an inventor. His oducation began in the elementary school of his native place, continued four y . in the public school in Gospie, Lika; four years in Lower Real School in Gorp c, and Throe years in Higher Real School, Carlstadt, Croatia, where he was grad to 1 is 1878. Originally he was doubled for the clarry, het provided upon his parents to send him to the Polytochnic Coh. . in Gratz, where for four years he studed mathematics, physics and mechanacc, follows, with two years in phil : hica; studies at the Unive saty of Prague, Borria. He began his practi arear 100 . 200 Buda, eas, H. pary, where he is an first electrical; , for a reporter, as commanded oil oldenpar prints r n ' 1, rosi out I 'a . mt to France and Gallan , m... e e o anivity onemed in . no'c to engliger to the market facture; 1.119 1 A ha is a resident or t, of which he is a matuг.1.201 с. 1.20л.

and hororary or resular member of many expectific societies, institutions and acceleries in the chited States and above interest of the British association for the melvines, and a life name of the Royal Institution of Great 1.1 chi; M. A. of Yale and L. Church, both sources being honorary, and a Bostor of Science of the (in a Folytochale School, the latter listing that in a principles of the power translassic, the Elliott Crosses gold modal was arranged him an recognition of original work first presented before the Franklin Institute and the National Electric Light Acade ation in 1893, in which wireless translassion was one of the most importance of years.

Among his inventions and dir c rise are: System of arc-lighting, 1886;
Toola motor and system of alternating t power transmission, popularly known as two-phase, three-phase, multi-phas oly-phase systems, which have created

a resolut r is electrical engineers winavactally adopted (1818); systems as a sub-conversion and on be ospillatory discharges, 1889; panorator . dia-frequency curren t.ose, 1890; transmission of our y through a single wire with. 1, 184; the Tesla coil or trans-involtantions of harm-frequency eff. and phenomena, 1891 - 93; system of warrand transport and intelligence De problème de oscillators and ginerators of discress coefficient, 1894 meenrones and discoveries in novel relations, a storial strongs and or an / whileho! in a serios of papers in the "listics I gaview, New York, 1896 in which he announced all the salfon: phonomena later attributed to a com; high-jotential magnifying transritter, 1997; a store of transission of power without wires, 1897 - 1905; economic trong policy of openty 'y refrigoration, 1898; art of Telaute atics, 1899-07; Just very of mationary electrical waves in the earth, 1099; "urning of all common nitrogram, and production flot or electrical effects of transcontany in rest os, 1990-1990; meth realistic for magnifying fooble offacto, 1 1-19 2; art of individuall: 1988-1903; the development of his system of morli-tolography unitale; h of the transmission of power without wires has organish of his attention was that twee. A munber of discoveries in the electrical field made by Mr. T 1., aut a led he has not yet announced, he considers of greater importance the an electrical work he has so far done. His rost important recent work is the discovery of a new mechanical principle, which he has embedied in a great variety of machines, as rev reillo gue and steam turbines, rungs, blowers, air compressors, water turbines, medianical transformers and transmitters of power, lot-air engines, etc. This principle enables the production of prime movers and of developing ten horse-power, or even more, for each poind of weight. By their application to aerial navigation, and the propulsion of vossels high spends are practicable, and the results so far obtained are very promising.



HI K 1 10 to to convey i ' 11 jours à c, win et /* *310 +3 millio 50 range and war of . in-. . . . to mor lator or in the standard of the stan till like demonstrations. The final judgment is left to direct the beginning. () courth of the now art and finitely and been pronound and characters touring of the power of the provide of the court of the tour of the touring of the power of the court of the tructive of the court of the tructive of the court of the power of the body, allow a like of airreing and save are now at the truct I have do.

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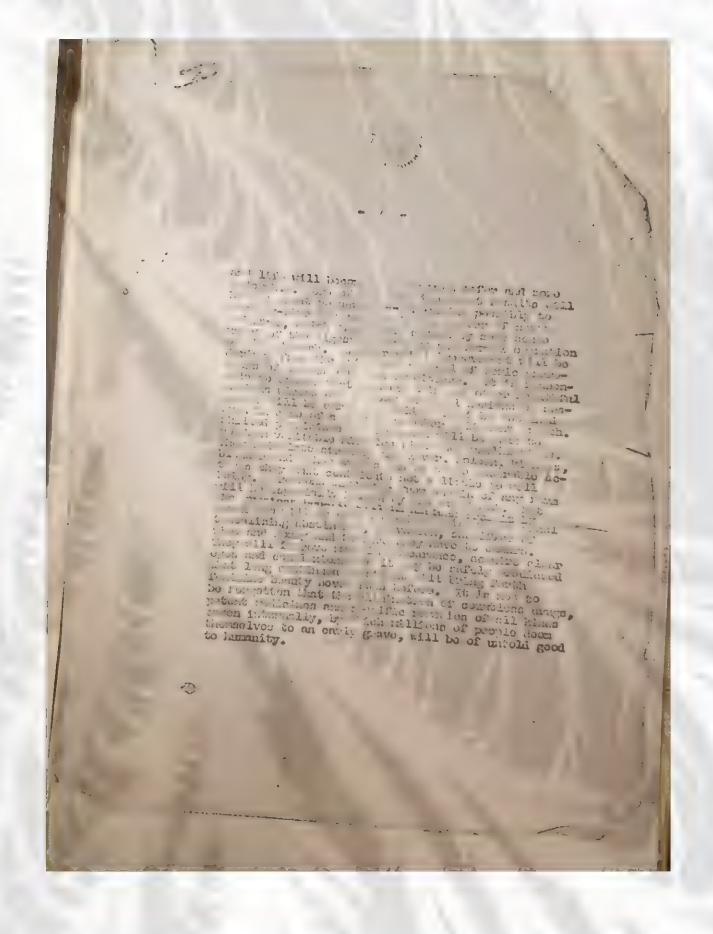
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Havis Twain whose books a yed by 11 to. He can to the laboratory in the st ships suffering from a variety of distress: will thur whis ails man but in less than two :) his to regulated his old vigor and ability of onforthe 1100 to the fallest ortent. Shortly after, a great calvity befoll mo:
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for ills of instinably value to animal and invision apparely a offering with which are specied. Telegration of the way and the and end and the visit of peralbilities but then I came to consider practical introduction I realized that it was entirely ur ultable. It was big, heavy and noter, called for a continuous supply of oil, part of width to a discises at in the root as fine spray; it constrained countries blo pater and remised a surface of objusticinale accommorter, inwing the nucceding grand trade grant trans eraits and finally evolved a deciral vision leaves . One to be decired. I.o. a docin which haves to be assured. The median will be very a . A rid light, a probable notse-losly without any lubricant, column a trifling arount of energy and will be, to by issurbedge, the most beautiful device even out on the market. The intention is to ombible it in action at the occasion of or annual recention is honor or the Proce which has been, unfortunately, delayed this year, and I nas boom, the properties, to have the year, and I nutternate that it will elicit great interest and receive wide publicity where I am greatly incoversually, there will a me in every household.

The practical application of Manageret Renary through my oscillators will profoundly affect human tions the body will function better in every respect



THE NEW TEXTA ELECTRIC HEATER.

TRICTLY CONFIDENTIAL.

This device is greatly superior to the usual flat coil type in efficiency and other respects. It consists of a thin polished metal tube acting as reflector and a base equipped with switch and connecting terminals, and carrying spaced surface of the same. In this arrangement the diffuse radiation is wirtually eliminated, and the heater operates as if the resistor were not present, the rays being projected from the reflector radially to the central or focal region eccupied by the beiling pot.

The principal advantages thus secured are the following:

- l. A very high efficienty, as much as 96% being atteinable.
- 2. The efficienty is practically the same whether the pot is large or small, since the density of the rays is inversely as the diameter of the vessel.
- 3. Due to these features the current consumption is hardly more than half of that in the best heaters of the type referred to.
- 4. The resistor has a relatively much longer life and can be made to last almost indefinitely in some Games. Also less wire can be used if desired.
- 5. The heat being largely confined to the range, the kitchen remains comparatively cool.
- 6. Another practical advant go is greater safety from a variety of accidents frequently occurring with ordinary ranges.
- 7. The new heater is especially adapted for use on shipboard, Pullman cars, nerial vehicles and automobiles.
- B. Likewise it is suitable . 11 kinds of service on the table, being free from the objections of the . 11 type.
 - 9. It saves considerable that in cortain applications.
 - 10. Owing to simplicity, the cost of manufacturing is low.

The subject you wish to correte about. In order to explain this Johnneum Einsten has moented the quentity "lambde They theory of gravitation explains this phenomenon perfectly

N.T. april 15.1932 He reed : great deal about to conservation matter being changed into force and force being changed into matter by the comi lays. In es abound. It is the same no say ing that the body on his changes into the more, and the much into the body. We know that the mud is a functioning me in free is a can be no mind, without water there can be no force. " Einstoin has for gears developed formulae explaining the mechanism of the women. In doing this he overlooped an important factor, namely the fact, namely that some of the heaverly codies are mereasing in distance from the sun. This is the same as country for ex business letter and forgetting

PROSPECTUS FOR MIL TESTA NITRATES CONTANY. discourses. M. Fikola Tesla, those Venestions to hear formed the basts of so many ha: more yeccat practical applications of electricity, and which to their world wide remignition to ver given this inventor a pre-occident Logition in the field of alectricity, has, by a suries of alscoveriso orthodoxy over many years, and all protected by bread patents the great amptates of the tries, days led a system the fixation of atmospheric nitrogen, in other words, for the the oxygen of the atmosphere into and compound (native anti- or the compounded, which, by its tremendous value and wide-reaching influence, bids fair to outrank many times his wonderful invention of the alternating current motor. Marting field programmy his own, and discovered - (over) & First, that his high-frequency electric dischargers in the almoaphore give in a mur degree a populiar electric chemical stress, which brings shout this most difficult of combinations: A stress with a ! Workers in this its a have recognized for years as bains one which not only must be of bremendous rower, but of almost in inite suddenness. Tolowant which has so materi ing rierred with the success of other workers in this field r. by Mr. resia's invention, been nimost entirely semeved on . 4-16-14-100 -Cucond, Mr. Tonla southing many of obtaining Inchi wieigh wollages (warmt Fre williams of voltas fre el parabus of most moderate . the allebase him to obtain the

early the the the immense possibilities of such resignessed the prediction that the years a departure, will in ago te made the or . Isogen would before I my develop into the electric fix where of almo, it exoclours. It that have to thing had been an isdustry nest to that of error An have wer his foresight in · luge me mean ment, how been made Just Com lowards commerci laspie Til show - by 1. pres plants have been exerted that entre wheel own quarter mellion horsepone and plantine. 120 coo down her hel alreed supper in the sunderlessure with the boards. method and apparelles whilising , no more than a few percen first cost so green that the subtraction of maintenance charges have rendered the business indifferently affractive to capital.

The fixation or burning of at mosphere histogen and is effected aconsmucely and the lightning discharge which brees to like prees pille from four to havely pounds of silvogenous compounds per acre per year, an enormous amount when considering their acarcedy ... This high affaciers is due to the great power anddenness, length and volume of . The discharge of and instead cooling toolling therefrom the new Took process owned & the Task Fileles Company. if The "Task Transformer" make it foughts fradecles & december affects of arrivally endimited power surpring over those of lightning as her denoushable is acted adjusting to the The high property is in called Tealer current as here the peculiarity to property of associating the dorment office of more really and ar his of Nilrogen, causing the gar to combine with à lesser espesdibire of energy

sttenus ted are so necessary for the highest efficiency.

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Third, by virtue of the jeculiar nature of Mr. Tesla's transformer, he is enabled to produce a certain tennage of product with such a amell amount of appearance and a consequently reasonable Investment as to multiply a thousand-fold, the capacity efficiency of his rlant, This item is of want importance in connection with this subject. Many experimenters have produced nitric acid from the atmosphere and there are now some very large plants engaged in this industry, era particularly in Borney, that involves upwerds of \$50,000,000, and which will absorb some 280,000 horse. power when it is fully expected, but without exception all these efforts have resulted in a first cost of apparatus so great that the interest and maintenance close thereof puts a fixed charge. upon each ton of the product that has herotofore rendered the business indifferently attractive to capital. Ignoring, thore

for the moment, the increased efficiency claimed by Mr. Tende, or his novel method of burning the atmosphere, and granting that he decrees are applied to the old process, he commerced and, it will be readily been all to be control to apparatus from \$100 per ton of the ton and a reconcile price, for the proper chiefly carden you contain price, for the proper to price of the property of the property of the property of the price of the property of th the plant instead of corrugato 100 dellar for he of annual froduct, we so need for an artist and for artist and for an artist and for artist and fo corresponding a expendition of a special deliters, or law of 1800. per 5000, and own the self of 1800 of 1800

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There is no escales

with & Their incomession file - buildenness oremoves one great aboliste which has so materially underfared with the success of the old method and appliances. " Toses means for generaling enormous electrice breasures with apperelas of surprissingly male. dimensions, sweller the production of disc charges on eres of the great length and volume to reseasely to the highest efficiency. 4/27 New mess, it is possible to operate unils. of any capacity honever great, hi burn the air as any desired side. and this increase. a thousand fold the effectiveness of the plants. The Tools appointen may be to heard to a larbour russing at a stapondown speed, while that we application aniploged is comparable to an old fastioned engine turning slowly. For The same performance the latter is every solmach and expensive. The and the bossing of the contract of the contrac and fitted the I This has af wild importance to The anterprese reducing the hardon of does to a mino a some the first cost and of sed aherges. To i Chertrale , and that diregarding XX (other or de)

fact, most of it is good for any hundred warra and consists it in the process is a continuous one to occasion the atmosphere into nitrie fumes, which in turn consists with water to make nitrie acid, and this goes on until the discontinuing of the process for an hour, a day, a month or a year, or that was due to plant lying idle and carrying it.

The process is a continuous one to occasion of the process for an hour, a day, a month or a year, or the process for an hour, a day, a month or a year, or that was due to plant lying idle and carrying it.

There is no loss upon the discontinuing of the process for an hour, a day, a month or a year, or that was due to plant lying idle and carrying it.

There is no loss upon the discontinuing of the process for an hour, a day, a month or a year, or that was due to plant lying idle and carrying it.

There is no loss upon the discontinuing of the process for an hour, a day, a month or a year, or that was due to plant interest. It is obvious, therefore, that is always interest and industry of this carrying it is a plant of the process for an interest. It is obvious, therefore, that is always and industry of this carrying it is a plant of the process for an interest. It is obvious, therefore, that is always to make the first cost.

under the United States patents granted to the Tesla applicable

to the manufacture of nitrates from the atmosphere, Which are he full manufacture of nitrates from the atmosphere, Which are he full manufacture to this subject, and he gas he handled he made and affect to immediately make a demonstration of the commercial magnitude in the immediate vicinity of New York

City, where experts and investors may see for thousand the practical application of the inventions in a full cited unit

approaches. In making this trat, he Tesla will have at his

disposal, a plant that has breaky cost over 1900,000, a large

part of which will be immediately englished. Kit is estimated that

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all expenses of the additional anymeratus, partily for attendance and all expenses of the control of the second containing the secon tion which It is proposed to be made. join a time application on the large scale contemptate). was of lost. . Her devoting hunely be his porfection of plans of made a large plane being entered of international reporte for them for a long. he a long esperience un 12. fixalen of Wilrogen by the old method and . Thorought form boar will the manageden and sale of the foroduces, In the man Luce XX

TESIA'S NEW SYSTEM OF TAULD PEOPLE TOP

his service man must invariably avail himself of some process in which a fluid acts to the of onergy, this being an essential stop in any industrial undertaking dependent on mechanical power. Evidently them, a discovery or radical departure in that domain must be of extreme importance and far-reaching influence on the existing conditions and phases of modern life.

Fluid promulsion is now offseted by means of pistons, vanus or blades, which entail complexity of construction and impose many limi-

mechanism and its performance. Tesla has dispensed with these devices and produced machines of extraordinary simplicity which, moreover, are in many other respects superior to the old types miversally employed. A few words will be sufficient to convey a clear idea of his invention.

possesses two calient properties: adhesion and viscosity. Owing to the first it is attracted and clings to a metallic surface; by virtue of the second it resists the separation of its own particles. As an inevitable consequence a cor-

toin amount of fluid is dragged along by a body propolled through it; conversely, if a body be placed in a fluid in motion it is impelled in the direction of movement. The practical forms of Tesla's apparatus consist of flat, circular disks, with central openings, mounted on a shaft and enclased in a cosing provided with ports at al and central portions, when deriving energy from any kind of 'luid it is admitted at the periphery and escapes at the centre; when, on the contrary, the fluid is to be energized, it enters in the centre and is expelled at the periphory. In either one it traverses the inpower being derived from, or imparted to it.

by purely molecular action. In this novel manner the heet energy of steam or explosive mixtures can be transformed with high economy into modulatical official; motion transmitted from one can fit to the state of the sta

broadness and applicability of a funcamental mechanical concept, the widest field for its

dynamic conversion of energy.

mover is determined by its efficiency, specific
performance relative to weight and space occupied.
cheapness of manufacture, safety and reliability
of operation, adaptability to construction in

1 --- correlative of running at high periphoral velocity, reversibility, and a number of other
features of lesser importance. In the majority of
these a machine, operating on the new principle,
excels. But there is one quality which is most
derivable in a thermo-dynamic transformer from the

economic point of view, and that is great resistence to deterioration and impairment of efficiency by heat.

of such vital bearing on the efficiency of prime-removers that it is of peramount importance to extend the thermal range as far as practicable. In the propert state of the art radical properties to energy of final can only be achieved in that direction. Such being the case, the capability of the machine to withstand deteriorating effects of great heat is the controlling factor in determining its commercial value. In that most desired quality the

Tosla turbine curpesces all the older types of hest motors. The Diesel and other internal combustion engines are fatally limited in this respect by their complete dependence on closely fitting sliding joints and unfailing supply of clean lubricant; while in the present forms .? tabines buckets, blades and inherent me-1 1 cficient's impose similar restrictions. These parts are too delicate and perishable to serve as elements of a gas turbine and this has been the main obstacle in the way of its successful realization. The rotor of the Tesla turbine prosents a relatively enormous

the fluid, instead of striking sgainst the propelling organs in the usual destructive manner, flows parallel with the same, imparting its momentum by adhesion and viscosity instead of impact. Moreover it has been shown that the officiency of this form of rotor is not impaired to any appreciable degree by a roughening of the viscosity and that it operated satisfactorily even if the working medium is corrected to an extent.

motive power under certain standard conditions, settled upon in the course of time, gradually forced upon the minds of engineers the Runkine

Cycle Officiency as critorion of performance and long continued endeavors to improve the same have finally resulted in complex multistage constructions entirely pasuitable for high temperatures. The Tesla turbine, by virtue of its exceptional heat-resisting and other unique properties, makes possible the attniment of creat fuel economy with but a single stage, included the offering the additional adviritages of an extremely simple. emall, compact, and reliable mechanism. But perhops the chief commercial value of this new primemover will be found in the fact that it can be operated with the changest grade of crude oil,

colloidal fuel, or powdered cosl, containing con-

siderable quantities of grit, sulphur and other impurities, thus enabling vast sums of money to be saved annually in the production of power from fuel.

itself to use in conjunction with other types, conscielly with the Persons with which it forms an ideal continuation. Although it proceeds introduction has been delayed by the force of circumstances, a number of years have been spent in exhaustive investigations and experiments on the basis of which the performance in any fiven case can be closely calculated. The first public tests were made before the

of the New York Edison Company where several muchines, ranging from 100 to 5000 h.p., were inctalled and overated with estisfactory remains. That the invention was appreciated by the technical profession may be seen from the excerts of statements by experts and

The sulient adventages of the Tesla turbine may be summed up as follows:

EFFICIENCY: The most economical of the present present present is the Diesel ongine.

But, quite apart of veny practical and com-

it is entirely dependent on comparatively expendive oil, so that the Tabla Gas Turbino,

working with much cheaper fuel, would have

the better in competition even if its efficiency as a the modynamic transformer were

appropriably lower, all the morese in view

of its greater machanical perfection.

which we surpessed by the Forsons in economy as well as extent of use, definite limits have already been reached and the only possibilities of saving fuel exist in the employment of stem at very high surprheat

one utilization of gas or oil as notive fuel. But none of the primemovers mentioned is edupted for such operation and although every effort has been made in this direction, no signal avocess her been schleved. The superhest is at most 250° F, this being considered : allimum permissible. All stiempts to con-. c. tir entone tip stormed rence lieve colled chiefly because of the inchility of backet structures to withstend the action of intense heat. The Tools Turbino can operate quite cetti factorily with the motive agent at very high temperative and, oning to this quality,

lends itself exceedingly well to these rurroses.

superior to all other forms. Each disk is virtually the equivalent of a whole bucket wheel, and as many of them take up but a small width the output of the machine, considering its weight and size, is surprisingly great. This, while not being a leasure of efficiency, is novertheless a feature of considerable importance in many instances.

CHEAPRESS OF PANDPY CTURE: The new turbine oun be produced without a single machined part except the shaft, all the cirks being runched

and the comings pressed. By this method, with proper machinery installed on a large scale. the cost of production many be reduced to a figure mover deemed possible in the construction of an engine. What is more, this can be done without material secrifice of officiency as small clearances are not essentially required.

an ever present danger in the running of high speed machines. A bucket turbine may at any moment run away and wreck the plant. Such accidents have happened ugain and again and this

A nemerkable quality of this turbine is its complets safety. As regards the waar and tear of
the propelling organs it is significant and, in
any event, of no consequence on the performance.

ADAPTABILITY TO CONTROCTION IN MARGE UNITY: In the present rechines there is a circultary of relationship because on its can be menufactured, they are very costly and difficult to manage. The new turbine is so simple and the output so large that the limits in this direction can be greatly extended.

TAILORGO TO DESCRIPTIONS BY HAVE VAL OMEN

whe bains advantage over the old types in which the maintenance of smooth surfaces and sharp edges is indispensable to efficient working.

In the Tesha Turbina, for the reasons already stated, the estimative actions of heat a decrease, the estimative actions of heat a decrease in the residual and corrective actions of heat a decrease in the residual and the second actions of relatively negligible effect. This fact has a most important bearing on the saving of fuel.

In this resent also it is superior to others.

The rotating structure carites no load and is

excellently adapted to withoutend tensile

stresses. Judging from the most recent tur
bine practice this quality should be of spe
cial value.

greatly headicapped by their incombility

of reversel fitch is a very nericer defect

in certain epplications, as the proposion

of vessels, necessitating the employment of

sumiliary turbines which detracts from the

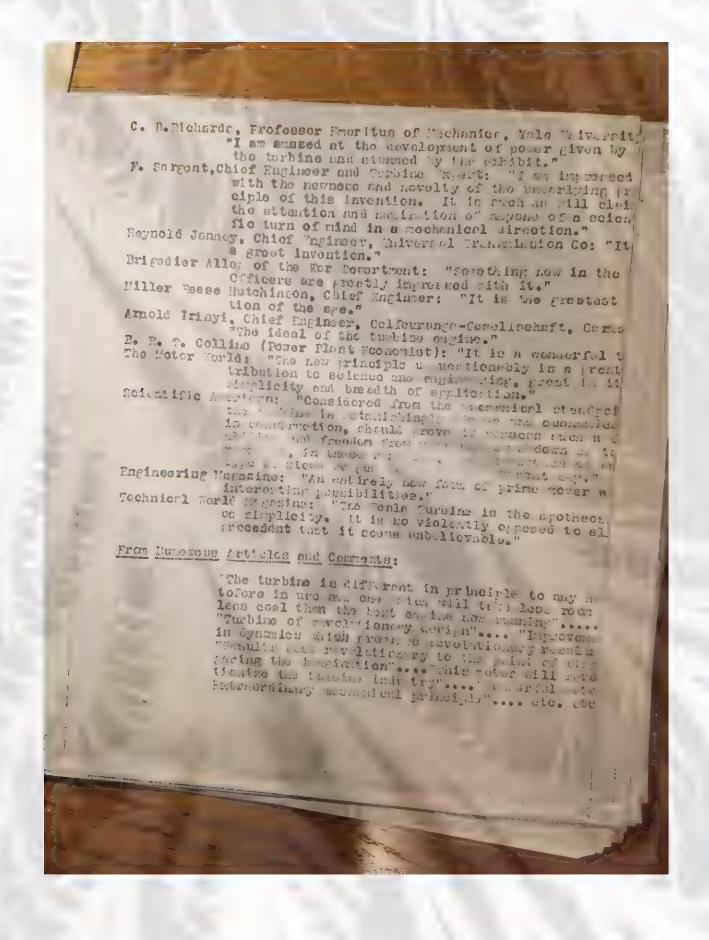
propulsive power and odds materially to the

cost of production and maintaines of the

oguipment. The Teels Turbine has the united

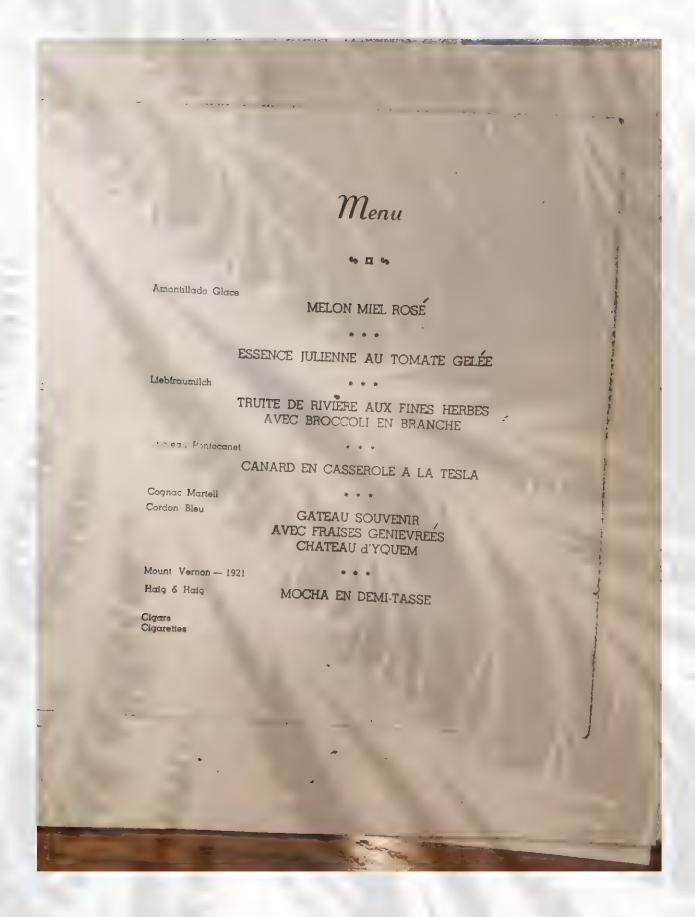
property of being reversible, not only this but it operates with the same efficiency in either direction. For marine purposes it therefore constitutes an ideal motor whether used alone or in conjunction with older types.

Decides the above it possesses
other desirable features, constructive and operative, which will add to its value and adaptability to many industrial and commercial uses
as, railroading, marine navigation, aerial propulsion, generation of electricity, refrigoration, operation of trucks and automobiles, hydraulic corring, agriculture, irrigation, mining and similar purposes.











FOR ACCOMP ANDEREY.

Nikola Tesla's forld fame is based on the inventions which he made during the last ten years of the past century. They lie in the electrotechnical field, especially in the field of low and high frequency alternating currents, and they are the result of extremely fruitful research work. Since that time there has been developed a mighty and many-sided alternating current industry which is still gro ing to-day, but Tesla's name is mentioned ever more rarely in connection with this industry, although it is not unknown that he had an emonent part in laying the foundations of the electrical industry.

In this book his countryman, S. Boksan, has collected an abundance of original mate ial about Tesla's life work and discussed it historically at a pritically in its bearing on the complete development of the electrical industry, so tiat the book offers a welcome opportuity to gain an inspiring insight into the creative labors of a genius and pioneer of the cleatrical industry.

Not rarely has in the modern commercial e does not take the part which the undinied greatness of h no ations. Technical men, accounty to their specialt appointments which have not it lies near to point out,

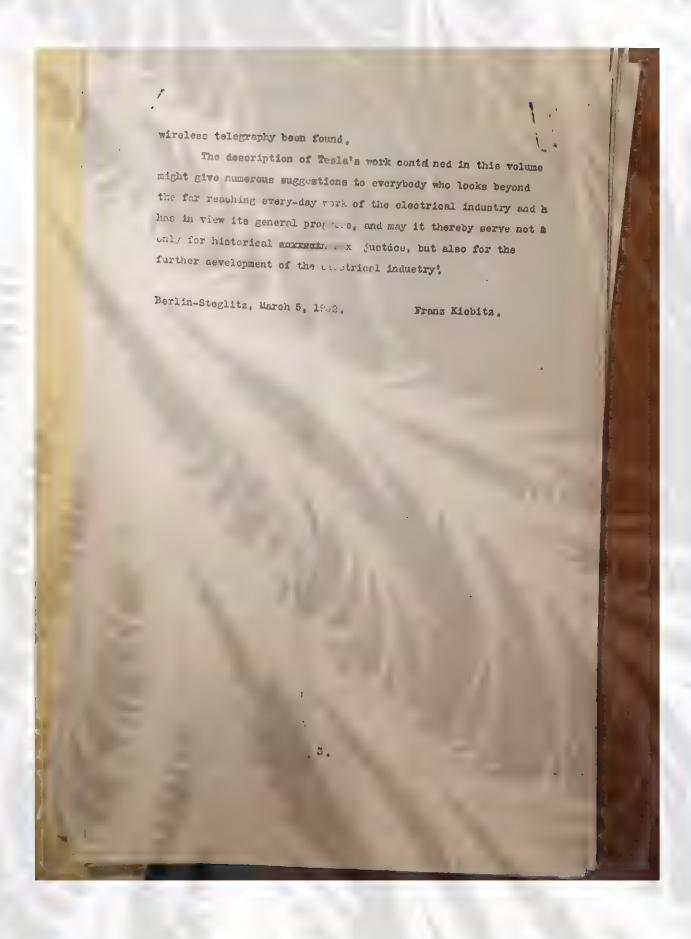
question been raised why. a'ion of electricity, Tesla the be expected in view of i ige differently the disared to Tesla. For me Puspect to the field of wireless telegraphy, the mana ald variations which our views hav undergone in the course of the. The conception of the Hertzian waves has already in agod, and that in a sensewhich

has not been favorable to the appreciation of Tesla's merit in wireless telegraphy.

Originally only such waves as Hertz himself had employed were called Hertzian waves, that is, waves of about one meter in length. The long waves of wireless telegraphy differ from them in manu respects. They do not propagate in such straight lines as true Hertzian waves and also do not spread out in free space, but at the surface of the earth. If the description of wireless transmission of energy by means of Hertzian waves is possible was therefore in the first instance at least problematical; and it is probable that Tesla would not have been at all understood, if in the nineties he had explained his results by Hertzian waves.

Abraham succeeded in proving that the waves emitted by a grounded transmitting conductor, excited by high frequency currents, can be calculated by the same equations as real Hertzian waves; only two limitations were to be made in this connection; first, the earth must not show any alectrical resistance and, second, it must be smooth. Although these conditions are in reality only partly fulfilled, the waves of wireless telegraphy have since that time been identified with Hertzian waves; yes, the wireless waves are occasionally even confounded with light waves.

Mercini worked origin: 1, with the short Hertzian waves omitted by a Righi Oscillator. When he turned to the use of long waves, in accordance with Tesla's precedent, he could without hesitation describe his propagation processes as Hertzian waves, and only thereby had the correct raiment for

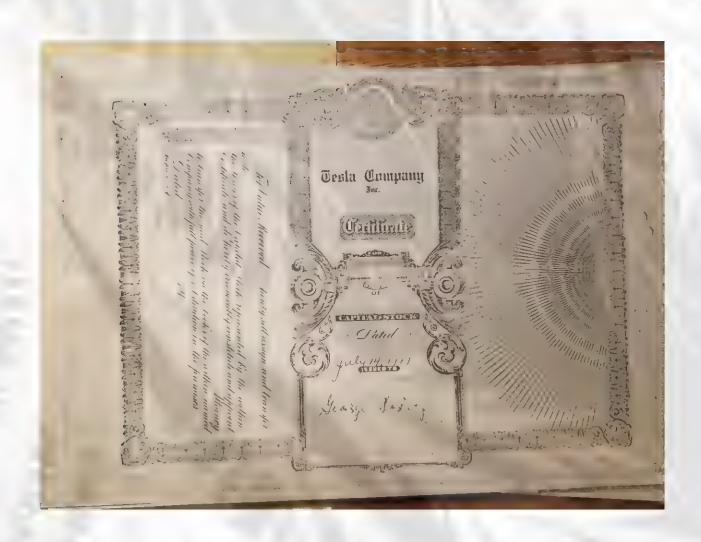


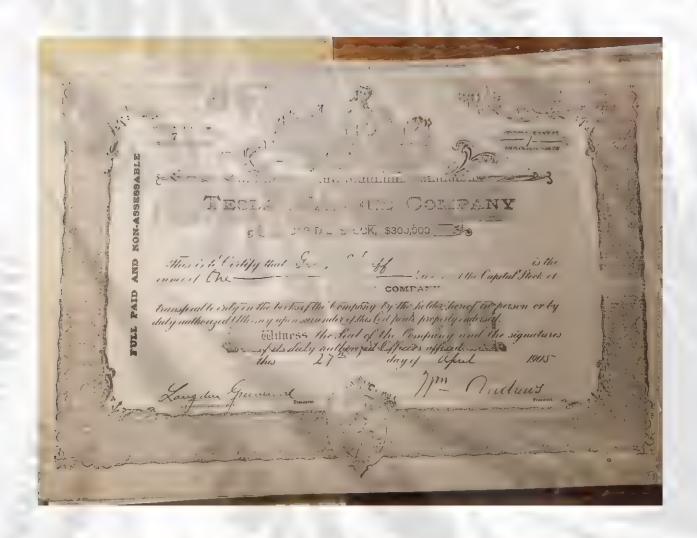
PREFACE.

The last forty years in the field of electrical engineers ing have been given their imprint by the palyphase current system, polyphase power transmission and the induction motor. Countless long distance central stations have been erected during this time in the entire world, many millions of horsepower have up to now been developed from water-power, and the development in this direction is gaining ever more in immensity. The transmission of electrical energy to great distances has in a short time become a mighty factor in the economics of electricity as rell as in modern engineering and present-day civilisation. The foundation for this development was laid in the year 1882, a round fifty years ago, by Nikola Tesla, through his discovery of the rotating magnetic field. Based on this epochal discovery Tesla himself, by intense research work lasting for ten years, made numerous detail inventions and discoveries which, together with his discoveries in the field of high tention technique, we disclosed in morethan forty patents and have created the 'c admit on for the great edifice of the present heavy current industry.

Following up this work, Tesla developed in 1890 his high frequency generators, and in 1891 his high frequency transformers, from which he has created in the succeeding jearsthe foundations for high frequency technique and high frequency investigation. His celebrated address in Columbia College before the American Institute of Electrical Engineers on May 20, 1891 was accompanied by scientific experiments







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SO LIBERTY STREET NEW YORK

New York, Apr. 19th, 1906.

Mr. Micholas Tesla,

"Allorf Astoria, CITY.

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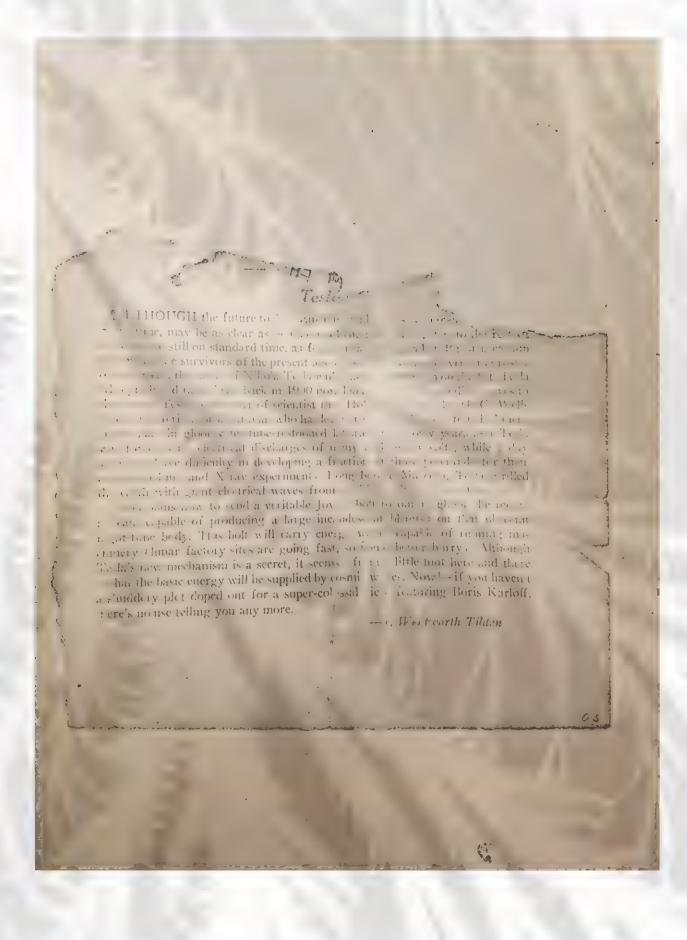
Please note we are gotter order bestattention in accordance with our quotation of April 16th.

Very respect ully,

FIW/H

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M Ambassador Fotitch Heads the

AT TESLA FUNERAL

Cathedral of St. John the Divine
is Scene of Yugoslav State
Function for Scientist

CREAT IN SCIENCE ATTEND

Ambassador Fotitch Heads the
Procession of Mourners—
Bishop Manning Assists

Inventors, Nobel Prize winners,
Raders in the electrical arts, high
officials of the Yugoslav Government and of New York, and men and women who attained distinction in many other fields valid tribute vectorday to Nikola Tesla, father of radio and of modern electrical generation and transmission systems, at an impressive funeral service in the Cathedral of St. John the Cathedral of St. John the Divine
The service, conducted in Scribian by prominent priests of the Serbian Dythodox Church, was genered and Deep Milkon, Compton and Driving Church, was genered and Deep Milkon, Compton and Driving Church, was genered and Scientists Pay Tribute

Best Milkon, Compton and Tribute Compton and Driving Church, was genered and Scientists Pay Tribute
Driving Compton and Tribute Compton and Driving Compton 's, leaders in the electrical arts, high

by prominent priests of the Serbian Orthodox Church, was opened and closed by Bishop William T. Manning assisted by Father Edward West, Sacrist of the Cathedral The Serbian Orthodox Office for the Dead was end by the Very Rev. Dushan Shoukletovich, rector of the Serb Orthodox Church of St. Sava, who officiated in the name of the Serbian Orthodox Church in America.

City Is Represented

in America.

City Is Represented

More than 2,000 persons attended the service. The city was represented by Newbold Morris, President of the City Council, who headed the list of honorary pall-bearers. Other honorary pall-bearers. Other honorary pall-bearers, included Dr. Ernest F. W. Aloxanderson of the General Electric Company, inventor of the Alexanderson alternator; Professor Edwin H. Armstrong of Columbia University, inventor of frequency nodulation and many other important radio, devices, Dr. Harvey C. Rontschler, director of the research laboratories, Westunghouse Electric and Manufacturing Company; Gano Dunn, president of the J. G. White Engineering Corporation; Colonel Henry Breckenridge, Dr. Eranko Cubrilovich; Tugoslav Minister of Agriculture and Supply; Consul General D. M. Stanoyevitch of Yugoslaviand Planetarium. don Planetarium.

Totltch Hends Procession

The functal service was held as an official State function of the agosinv Government, which was repositive to the state of the state of

Scientista Pay Tribute

Scientists Pay Tributs

Drs. Millikan, Compton, and
Franck paid tribute to Tesla as one
of the world's outstanding intellects, who paved the way for many
of the Important technological developments in modern times.

Among the many floral offerings
was a wreath from King Peter II
of Yugoslavia; the Royal Yugoslav
Government, Ambasador Fotteh
and many Yugoslav societies.

- Chief mourner was Sava K isamovich, nephew of Dr. Tesla and
president of the Eastern and Central European Planning Board, representing Yugoslavia, Czechoslovakia, Poli ad and Greece.

- The body wis tiken to Fernchiffe Cimetery, Ardsley N y
where t will be in the free ing
yould intil plants are completer.

GAPT, EDWARD B. WINN

CAPT. EDWARD B WINN

SAN JUAN, Puerto Rico, Jan 12 (I) Captain Edward B W. m. United States Army Finance Of-ficer at the San Juan departmental headquarters, died yesterday at the ago of,52.

Other philuaries on preceding made.



FRENCH — Wednesday, 8 to 8 p. m. SPANISH — Wednesday, 7 to 9 p. m. ITALIAN — Wed & Fri., 8 p. m.

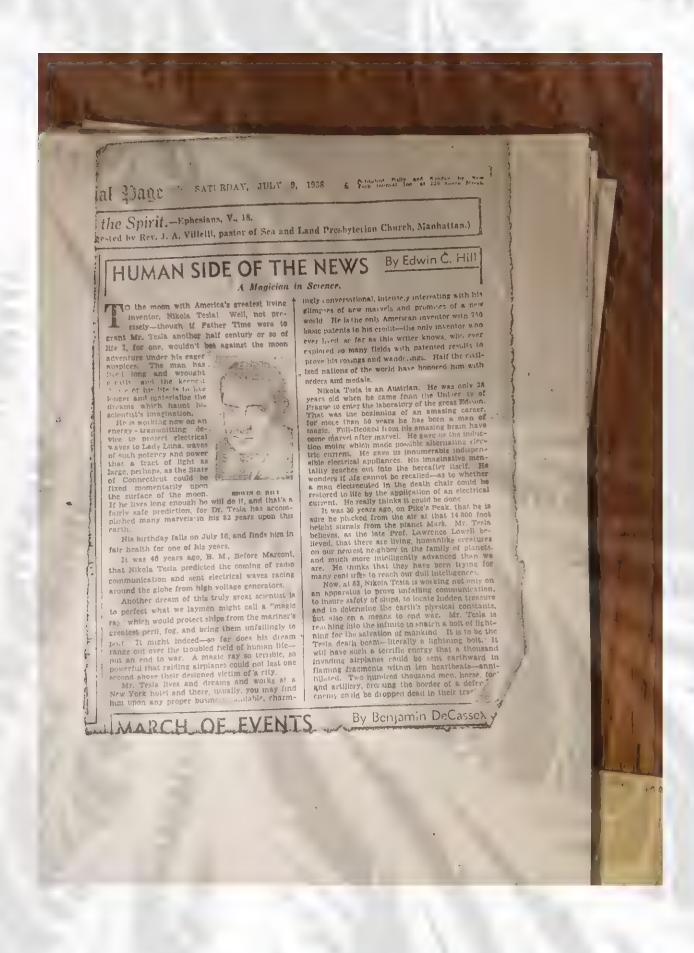


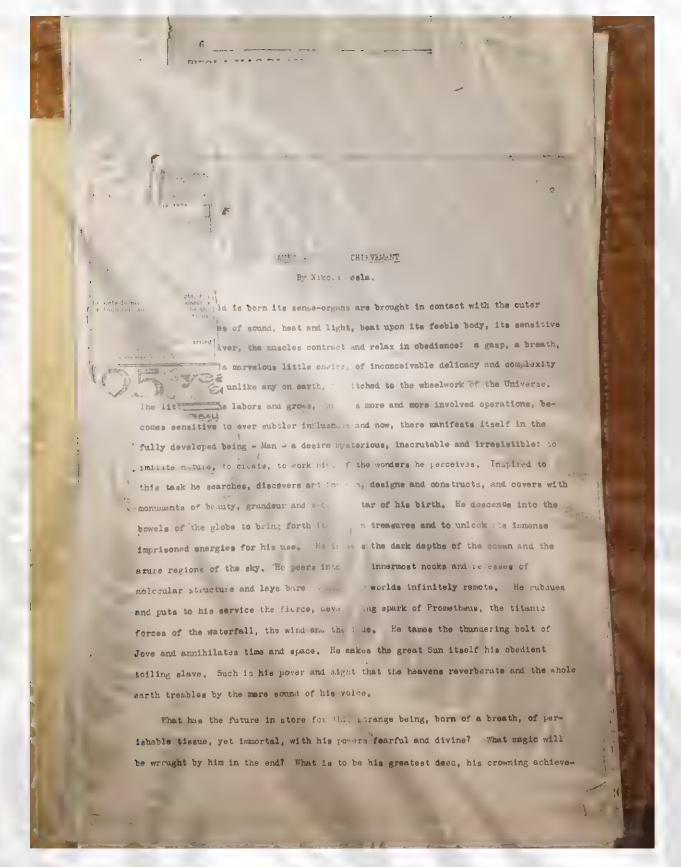


















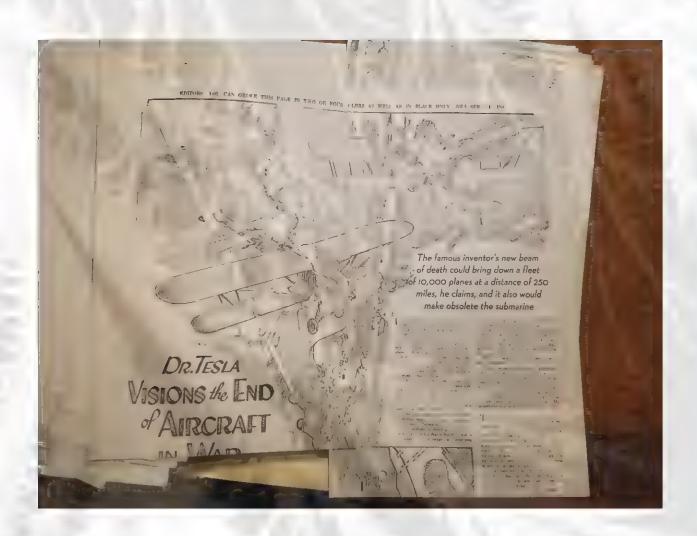












as a delit be An systane Dieus the as 1 to 10 be the An vision brown us acts calmed its centre to not one of the control of the learn 15 of a secretary with a country which is a control of the learn 15 of the control of t the sattleships will ride to sea safe from air raids, for they will be equipped with smaller plants for generating a beam of sufsmaller plants for generating a beam of sulficient power to destroy any attacking air-plane. But they will not be permitted to come near the shore of a protected country and attack it with any chance of success The nation which has the best equipped hattleships, however, will gain the supremacy of the reas. Submarines will be obodete, for the methods of detecting them will be perfected to such a degree that there will be no longer any advantage in submerging An artist's conception of the way a technician, sitting in one of Dr. Tesla's great generating plants, would use the new beam to destroy hostile airplanes. 010

ic speed, and any amount be transmitted by them. it a gun, but one which is to the present-

protected world, in which then time to pursuits of

if the world, every coun at plants which will offer the nation itself and in orders. Only ships flying can sail into a foreign

resembling first placed at ig a country's border, will ney are immovable, they lly means for defense, and upossible will greatly adrek Magazier Printed in U.S. A.)

When a submarine is located the beams will function under water though not quite so r

FOUR new inventions of Dr. Tesla are invalved in the creation of the beam

"Briefly, the first comprises a method and apparatus for producing rays and other manifestations of energy in free air, eliminating the high vacuum heretofore indispensable." he ex-

plains
"The second one is the process for produc-

ing electrical force of immense power.

"The third method amplifies the process, and the fourth produces a tremendous electrical repelling force."

In times of peace such a plant can be used to transmit power in any amount up to its full capacity and to any place on the earth visible through a telescope, according to its inventor.

n to 10 or sus less cover look a

face of more as the fact tree generations almost all members of the familie were in senting the entire tree are the entire tree are the entire tree area. My modes we carry amis Manda who was rotted as an incention of merical applicances. The office thouse which the perfected was her own wearing ousding. "Her family can be based based to the seventh century, in the historical records. My goodfather was an Hercen Capitalian in 1999.

PUSEA began to invent at the age of six. Inhoratory

As ne grew up his interest focused in the laboratory. "I steep about one and one-half hours a might," the inventor says, "I think that is enough for any man. When I was young I needed more steep. But age doesn't require so much. There are so many things to do I do not want to apend time steeping needlessly. In my family all were poor sleepers. Time spent in sleep in lost time, we always felt."

I esla, busy with his 700 inventions, never had time for marriage. He never had a girl in his voing days. He never had a romance. There was no lesure for them. His diet is simple. He lives chiefly on vegetables, cereals and milk. The menu includes noions, spinach, celery, carrots, lettuce, with postators necessionally. Whitea of eggs and milk complete the diet. There is no meat on his vegetables described plate. He never unokes or tartes tea, coffee, alcoholic beverages or any other stimulant.

While he is perfecting the beam which will while he is perfecting the beam which but defend nations from attack, the inventor is playing with other sdeas. He goes from one to the other, he says, as this or that gains paramount inferest or some new clew is suggested.

BUT what is giving me more fun than anything I have done for a long, long time," Dr. Tesla explains, "is an electric bath which I hope to have ready for general use very

which I hope to have ready for general use very suon.

"It doesn't require much room. There is a platform on which the person stands. He turns on the current. Instantly all foreign material such as dust, dandruff, scales on the skin and microbes is thrown off from the body. The nerves, too, are exhibitated and strengthened. The 'bath' is excellent for medical as well as for cleaning purposes."

However, the war picture gives the master inventor more satisfaction than the minor inventions. He is rejoicing because he instrument.

ventions. He is rejoicing because his instrument of death will save millions of fives and mestimable property

His only regiet is that there may be another war before the discoveries he has made have been placed before the Disarman ent Con-

ference at Geneva, and generally adopted by the nations of the world
"The next war and I am afrail that these will be one before long." he ways, "will be fought in the air. But if the beam is adopted war in the air will cease.

Whatever battles there are thereafter will be confined to the sea. But no nation will dare to a tack another nation when every country is a simed. There will be a general feeling of safety throughout the world."

tober 20-21, 1934. In Ordering Mat Designate Page 3, OCTOBER 21

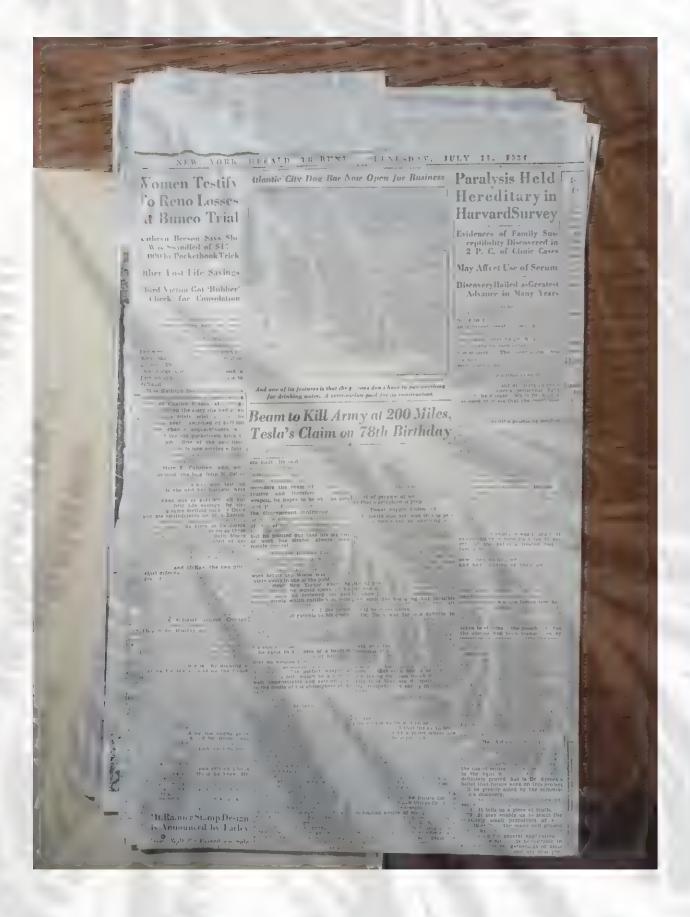
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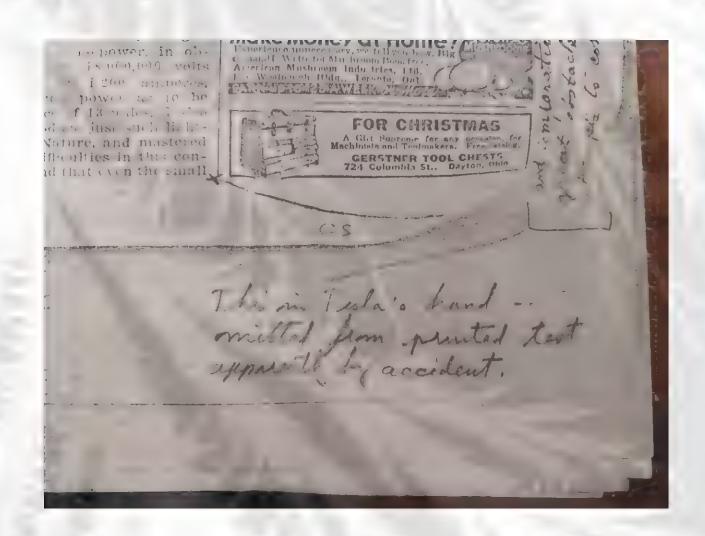
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HUGO GERRISBACK, I BITOR

WEGGIELD SECOR, MANAGING EDITOR

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An Editorial By HUGO GERNSBACK

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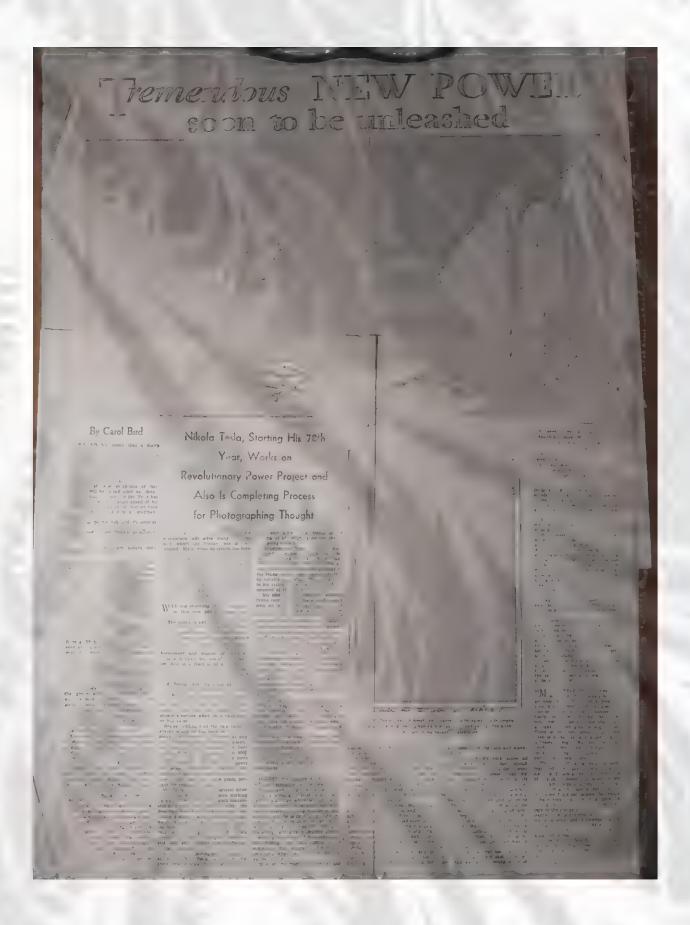
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SHORT WAVE CRAFT IS PUBLISHED ON THE 5th OF EVERY MONTH This is the November, 1933, Issue-Vol IV No. 7 The next Issue Comes out November 5th

Ed ternal and Advertising Oy .. 36 vs Park Place, New York City



Tremendous HEW POWELL sound to be unleashed Nikola Toda, Starting H's 78th Yasa, Warles on Revolutionary Power Project and Also Is Completing Process for Photographing Thought



Revolutionary Power Project and Also Is Completing Process

Freat scientific projects.
Several of these inventions of discoveries will be looked upon as miracles by many people, for Mr. Tesla has long been a scientst years shead of his time one will of the several has been a scient of the several has been a several has been a several has been a scient of the several has been as the several has been a scient of the several has been a scient of the several has been a scient of the several has been as the several has been as the several has been as the several has been a scient of the

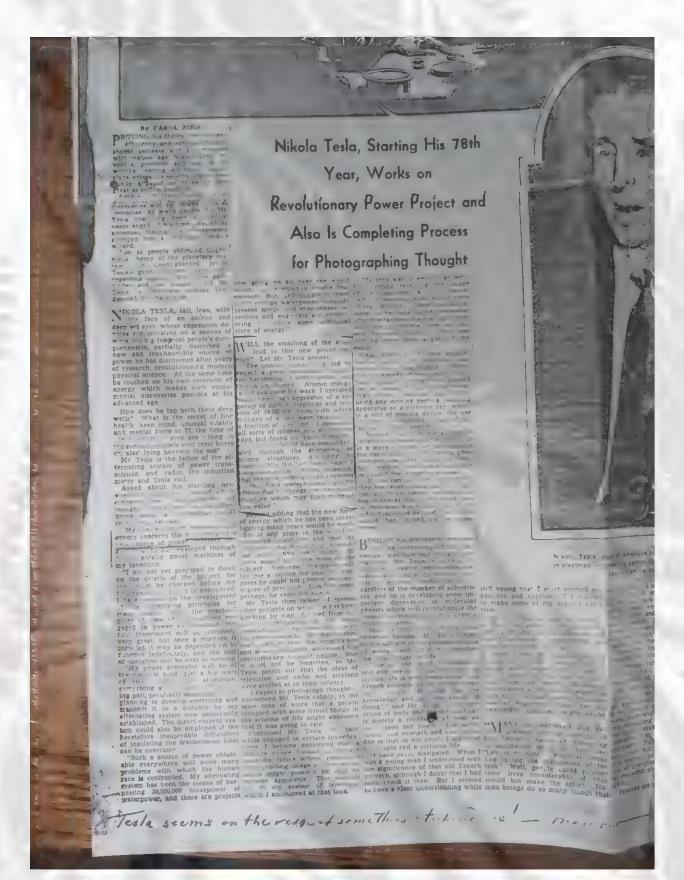
Also Is Completing Process

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Tesla seems on the reign of something to head

remendous NEW POWER soon to be unleashed Nikola Tesla, Starting His 78th Year, Works on Revolutionary Power Project and Also Is Completing Process for Photographing Thought "Tesla seems on the verge of something













To the Ladies!



PRINCESS ALEXANDRA KROPOTKIN

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Light on the Cuban Situation

Former President General Mario G. Menocal Stresses Short-Sighted Policy of Present Administration

OPI a this country who chronically complain of the economic situation and sub-normal conditions of business do not seem to realize that, in actual fact, we are much better off than the rest of the world

Coba, as a case in point, near enough for Americans to study, et a. store off than we see. Due to a short-sighted and any sourcetin, government, Cuba has drifted into a serious cost mice crisis. Cuba hid her chance in the latter part of the miner of last year, but lost it on the 13th of lugust it Piner del Rio, although in the opinion of experts the mandest elements in the nation favored the restora to power of former President General Mario G. Meno, al.

sect of Menocal, during his administration, proved limited to oc that admirable combination in a chief executive accounts man of a high order as well as a political laser gitted with vision and judgment. Qualited observed as a firmly of the opinion that he could have saved to past few years. The best minds of the country law is him and his policy and still do, but the reign nearly apparently, is too strong to be broken as yet we there Cuba will be able to work herself out of her present difficulties, hands appears a she is, remains to be seen. It appears to persons in a position to speak with authority that she will not be able to do so. At any rate,

her return to comparative prosperity can be expedited only through a change of administration.

The short-sightedness characteristic of the present government manifested itself recently in its advocacy of a grant of a 40 year monopoly on the sale of oil and gasoline in Cuba in exchange for the payment of Cuba's national debt. General Menocal opposes such a scheme on the ground that it is unconstitutional and would be a bad business deal. His intimate knowledge of the resources of his country enables him to estimate the probable value to the government of the oil deposits for the next 40 years at \$3.00,000.000, whereas the national debt is only \$200.000,000. Thus the Cuban Congress is detected in the act of throwing away the huge sum of \$100,000.000 merely as a political move designed to appeal to the more short-sighted members of the body politic.

"N) Lature government of Cuba would recognize such an agreement," General Menocal declared, "but would, drubt ess, annu, such i monopoly." The tax on gasoline, General Menocal observed walas about \$12,000,000 a year General Menocal, said that Oscar Cintas, who is soon to be Chira. Antiassador to the United States, had been in Wall Street for several days trying to negotiate the oil monopoly agreet ent.

Such mis steps as this would be avoided under an idminist from a neerned with the true we fire of the nation and not solely with questions of political expediency.

Stimulus and Response

R. NIKOLA TESLA, who contributed the basic inventions which made possible the commercial development of electricity, has hit upon another discovery when, we feel, will eventually benefit the human race in a manner comparable to the benefits derived from the systemous fluid which so thoroughly permeats all centers of civilization these days.

I as discovery, the details of which were only recently received to the press, is comprised in a simple experiment which shows the mechanical nature of the function simple. Or Tedi, in demonstrating this experim arranged a number of tuning-forks at equal distriction to the point where all the other forks responded to it, selected one of the imalier forks at random, and rileit and the recent of instances of the matter forks and for a long time, while selected fork is not to it. He then returned to both tickery is first room and, pacing the two bids that respect is appropriately begin gently extitute matter for and only one fork responded—and was the one in the mount at rindom and treated to planged exposure to the vibratory waves of the master to

This experiment proves that the function of memorimechanical and it pass avenues of investigation whosem to us to lead straight to the heart of the question evidence of evolutionary processes in nature. The conditioning of an organism or of insensate atomic structures of any kind to repeated impressions obviously brings about some mys-

'Speak the Language Trippingly on the Tongue"

Try this on your ukalele. A bitter biting bittern bit a better biting bittern, and the bitten bittern bit the bitter bittern back, and the bitter bittern bitten by the better biting bittern is now a bitter biting bittern bitten back.—U. S. S. Breeze Kidder.

Tight-Wads

It's little use! New Jersey elected an "economy Leconomy and then the members voted themselves \$51 de me wivel chairs and \$24 card tables.—Minneapolis

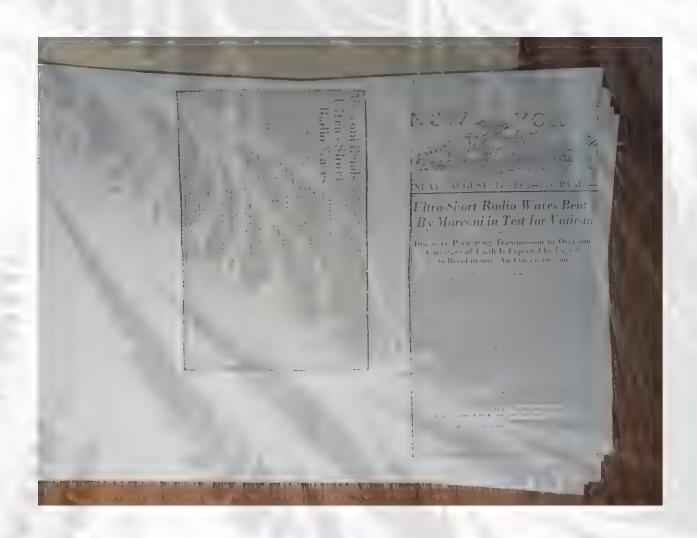
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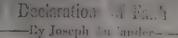
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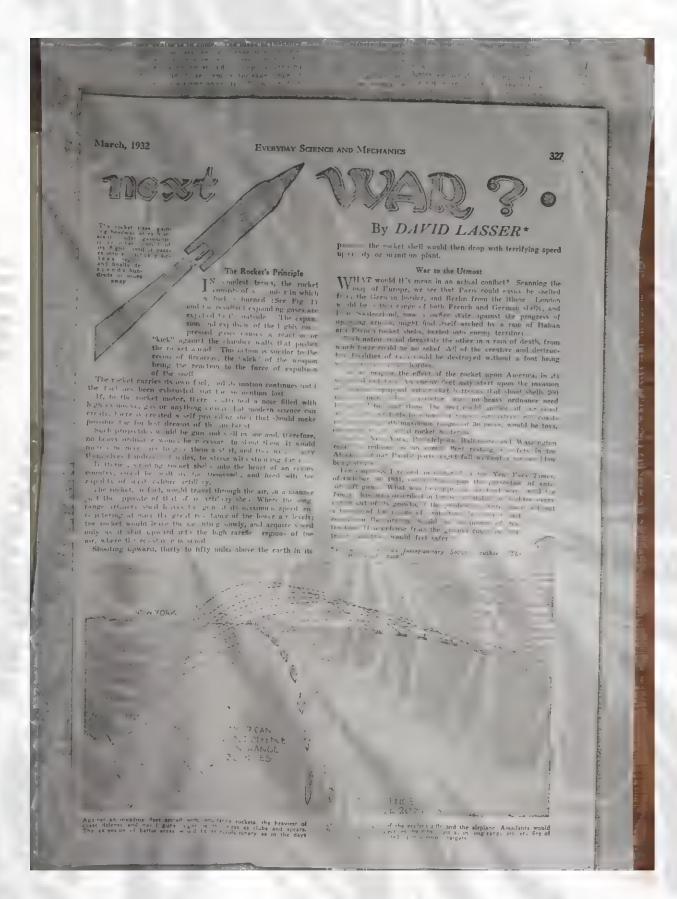
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Editorial Comment

Radio Waves and the Transmission of Electrica Energy for Power

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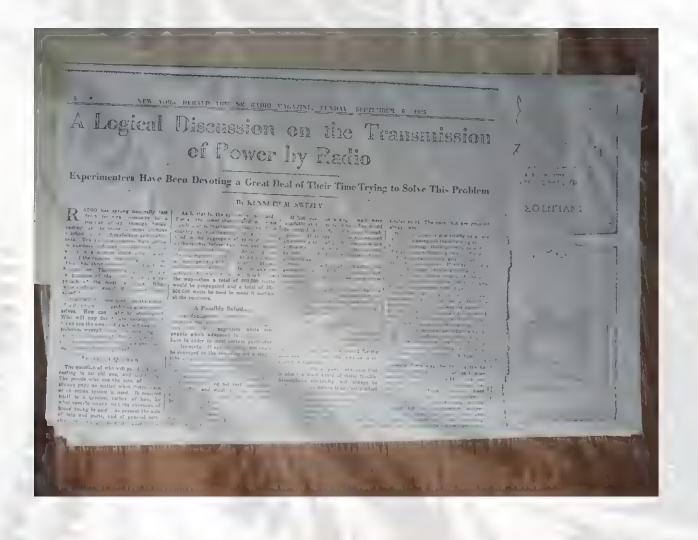
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